

A faint, dotted map of Ravalli County, Montana, is positioned in the upper left corner of the page. It shows the county's irregular shape and internal road networks.

# **RAVALLI COUNTY TRAILS PLAN**

Developed for the Ravalli County Park Board  
by the Bitter Root Land Trust  
January 2010

## Acknowledgements:

The Bitter Root Land Trust would like to thank the following organizations who have contributed to the Ravalli County Trails Plan:

- Ravalli County Park Board
- Ravalli County Resource Advisory Committee
- AmeriCorps Vista Program
- Geum Environmental Consulting
- Community Volunteers

*Trails have multiple values and their benefits reach far beyond recreation. Trails can enrich the quality of life for individuals, make communities more livable, and protect, nurture, and showcase America's grandeur by traversing areas of natural beauty, distinctive geography, historic significance, and ecological diversity. Trails are important for the nation's health, economy, resource protection and education.*

—AMERICAN TRAILS, *Trails for All Americans* report, 1990

*Although this planning document is intended to guide the decision making process related to trail development in Ravalli County for many years to come, all information included in this document should only be considered current as of the initial adoption and publication of the document. Information contained within, in particular technical or engineering information and legal requirements, should be considered a guide and should be verified for current status before any binding decisions are made.*

# EXECUTIVE SUMMARY

Ravalli County is known for its wildlife, water, open spaces, historical sites, and traditional rural character. People move to and stay in the Bitterroot Valley to experience a unique lifestyle built around these attributes.

However, in recent years, Ravalli County has experienced a period of rapid growth that is changing the area and transforming the rural lifestyle that residents have enjoyed. Highways and roads where one could once ride a bicycle, walk, or ride a horse have now become unsafe due to large volumes of traffic. Absent a conscious community effort to maintain and create alternatives to automobile travel, development can inadvertently cut off access to some of the open spaces, public lands, and recreational opportunities in the area.

Despite economic fluctuations, areas such as Ravalli County will continue to be desirable places to live and should employ mechanisms that allow for a continuing high quality of life.

Throughout the nation, communities are placing a high importance on trails because of the benefits they bring. In addition to providing recreational opportunities, numerous studies have identified and quantified many other ways in which trails (and parks) benefit individuals and improve communities. *(Please see side bar)*

## BENEFITS OF TRAILS

Trails offer an alternative mode of transportation, connecting homes with schools, parks, offices, and shopping areas. As transportation corridors, trails improve public safety and contribute to a healthier environment, with cleaner air and less traffic congestion.

Trails promote health and fitness by providing an enjoyable and safe place for residents to exercise regularly. Walking, bicycling and similar activities are excellent forms of exercise that nearly everyone can do, yet many people do not because they have no safe, convenient place to go.

Trails function as a meeting place for the community, leading to greater interactions among residents and improved community cohesion.

Trails provide opportunities to interpret the natural environment, history, and culture. Trails can serve as outdoor classrooms for schools.

Parks, trails and greenways (linear parks) protect natural resources, provide wildlife corridors, and preserve open space.

Studies have shown that trails stimulate local economies, increase local tax revenue, attract tourists seeking new recreational opportunities, and revitalize business districts. Access to trails is an amenity that home buyers seek, and the value of most properties is enhanced by being near a trail. Employers seek attractive communities that offer trails and open space when choosing where to locate new plants and offices.

"In short, recreational opportunities create healthier individuals and communities, and contribute to the overall quality of life." *Ravalli County Master Park and Recreation Plan.*

A trails plan, which complements the Ravalli County Master Parks Plan and other formal and informal community planning efforts, can be a valuable tool for decision makers and community members. The Bitter Root Land Trust with collaboration and authorization by the Ravalli County Parks Board developed this document. A public perception and scoping process was conducted throughout the development of the Trails Plan in order to ensure that it would appropriately represent community opinion towards a trail system in the County. Additionally, a review of successful examples of trail systems in communities similar to Ravalli County and of current standards and practices in transportation and recreational planning related to community trail systems was used when developing content and recommendations for this plan.

From the public comment that was received, it appears that residents of Ravalli County are most interested in developing two broad types of trails systems in the County:

1. Trails primarily for transportation purposes, generally running along north/south corridors that can be used to access activity centers such as schools, work, and shopping.

2. Trails primarily for recreational purposes, generally running east/west, connecting town centers with the Bitterroot River and its larger tributaries; rural lands; and the Bitterroot and Sapphire mountain ranges.

Successful trail systems have a number of characteristics in common. Well-planned trail systems:

- Are sited in a manner that is pleasant to the user and scaled to a human level;
- Facilitate safe and comfortable interactions with other users;
- Link places users need and want to go;
- Are interesting and allow for a variety of uses and users;
- Support cohesive communities by functioning as shared public spaces;
- Have financial support and a long-term maintenance plan providing for increased viability.

The purpose of the Ravalli County Trails Plan is to serve as both a vision for community trails system planning in Ravalli County and as a resource guide to help decision makers set priorities related to trail development within a realistic framework. The Plan includes an inventory of existing trail-related resources; a summary of and results from the related public participation process; recommendations for the implementation and maintenance of a trail system; and other pertinent information.



The goals that have been developed for the Ravalli County Trails Plan are:

- To build and maintain cohesive communities within Ravalli County and positive relationships with surrounding areas.
- To promote and encourage recreational, health, and fitness opportunities.
- To protect the wildlife habitat and ecological attributes that make Ravalli County a desirable place to live and visit.
- To increase economic development opportunities in Ravalli County.
- To respect and protect the rights of Ravalli County residents, especially trailside landowners.

Each of these goals has an accompanying set of specific implementation policies, which can be found in the Trail Plan. It is highly recommended that the goals and policies be used and referenced when developing a trail system in Ravalli County in order to provide the greatest consistency and benefit to the community. Of course, the desire for public trail system must be balanced with the community's capacity to both initially construct and then operate and maintain the trail over the long term.

Developing a trail system in Ravalli County will best be accomplished through a mindful and deliberate process

that takes in to account the needs and interest of all major stakeholders: private landowners, public users, and County boards and staff responsible for maintaining and administering a trail system. In addition, it is critical that sufficient planning be dedicated to the long-term maintenance responsibilities in as well as short-term implementation. The creation of a trail system in Ravalli County could potentially take many years to attain, but the goals of this plan can still be achieved in the short term as opportunities present themselves. These opportunities will be more easily recognized if the County has adopted this planning document and integrated into current practices.

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# FINDINGS

## RAVALLI COUNTY TRAILS INVENTORY

According to the Ravalli County Parks Master Plan, there are four designated trail routes in Ravalli County with maintenance responsibilities shared between Ravalli County and the Montana Department of Transportation (MDT). Additionally, there are a number of parks and trails within municipal boundaries including the loop trail around the City of Darby and the Hieronymus Park and river trails in the City of Hamilton. It is locally known that there are many routes that are used for the same purposes as trails, but are not officially designated as such (sidewalks, roadways, etc). At this time, there is no existing data on usage of non-designated trail routes.

Please reference the Ravalli County Master Parks Plan for details on the respective regions, available recreational facilities, and development and maintenance responsibilities.

This inventory is the first attempt at a trail inventory for the County in recent years. The following chart may not represent a complete inventory of existing trail resources and should be updated as more information becomes available.

Region/ Area	Trail Name	Length	Owner
Florence to Stevensville	Florence Walkway/Bike Path	6	MDT
Lone Rock	NA		
Stevensville south	Stevensville Walkway/Bike Path/Stevi Cut-off	2.4	MDT
Victor	NA		
Corvallis / Pinesdale	Woodside Walkway/Bike Path		MDT
Hamilton to Woodside	Hamilton Walkway/Bike Path	4.6	MDT
Darby	Darby Town Trails	~2 miles	Town of Darby



# PLANNING PROCESS

The Bitter Root Land Trust was awarded a grant to complete this Trails Plan by the Ravalli County Parks Board in October of 2004. Over the next two years substantial progress was made regarding project research, scoping, outreach, and public participation, including:

- Organizing and convening of a trails committee
- Contact with Corvallis Civic Club
- Contact with Florence Civic Club
- Contact with Montana Recreational Planning Department
- Educational booth at County Fair
- Field trip to identify trails in the Lone Rock, Darby, and Corvallis areas

A series of public meetings were held during the planning process in order to disseminate information about trails and the trails planning process, as well as to gather information about which areas community members would like to see connected by trails and what kind of trail corridors might be most desirable.

In January and February of 2007, Bitter Root Land Trust's Community Trails Program held mapping workshops throughout the Valley. Participants discussed

potential trail routes, private landowner issues specific to their communities, and potential funding sources, while drawing desired trail routes on aerial photo school district maps.

In March 2007, a meeting was held with the Hamilton PTA to obtain information more specific to routes that would potentially be heavily used by school-aged children on their way to/from home/school within the Hamilton School District.

A number of broad themes emerged during the public meetings. The most frequently identified types of places that people would like to be able to access with trails included:

- Schools
- Eastside Highway
- Town centers
- Lee Metcalf Wildlife Refuge
- Bitterroot River
- Como Lake

The most frequently identified potential trail routes trail corridors include:

- North/south routes along Highway 93 throughout the County

- North/south routes off of Highway 93 (both east and west sides) throughout the County, such as the Bitterroot River, the Big Ditch, and the Montana Rail Link railway
- North/south routes along Eastside Highway
- Routes following major drainages
- Routes following existing primary and secondary motorized vehicle transportation rights-of-way

Additionally, community-specific information on amenities and corridors was gathered from each of the planning regions.

### Florence/Lone Rock

Desirable trail system connection points	Potential trail system linkage routes
<ul style="list-style-type: none"> <li>• Florence and Lone Rock town centers</li> <li>• Missoula</li> <li>• Schools</li> <li>• Wilderness and rural areas (primarily on the east side of the valley)</li> <li>• Peterson Lake</li> <li>• Charles Waters campground</li> <li>• Lee Metcalf Wildlife Refuge</li> <li>• Chief Looking Glass Road</li> </ul>	<ul style="list-style-type: none"> <li>• Links between Florence and Lone Rock</li> <li>• Links with Highway 93 and Eastside Highway</li> <li>• Alternative north/south routes off of highways</li> <li>• Along canals/ditches</li> <li>• Up the Eight Mile Creek area</li> </ul>

### Stevensville

Desirable trail system connection points	Potential trail system linkage routes
<ul style="list-style-type: none"> <li>• Stevensville town center</li> <li>• Lee Metcalf Wildlife Refuge</li> <li>• Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Closely parallel existing roads and Bitterroot River</li> <li>• Link town center with Highway 93 and Eastside Highway</li> <li>• Alternative north/south routes off of highways</li> </ul>

### Victor

Desirable trail system connection points	Potential trail system linkage routes
<ul style="list-style-type: none"> <li>• Victor town center</li> <li>• Bitterroot River</li> <li>• Bitterroot Wilderness</li> </ul>	<ul style="list-style-type: none"> <li>• Railroad corridor</li> <li>• Along Bitterroot River</li> <li>• From Victor town center into Bitterroot Mountains (primarily for recreational uses)</li> <li>• Oriented much more toward recreational uses than general transportation uses</li> <li>• Gravel or dirt trails into rural areas</li> </ul>

## Corvallis

Desirable trail system connection points	Potential trail system linkage routes
<ul style="list-style-type: none"> <li>• Corvallis town center</li> <li>• Bitterroot River</li> <li>• Pinesdale</li> <li>• Calf Creek Wilderness area</li> <li>• Hamilton town center</li> <li>• Existing parks</li> <li>• Victor town center</li> </ul>	<ul style="list-style-type: none"> <li>• Along Big Ditch</li> <li>• Along rail line</li> <li>• Along Eastside Highway</li> <li>• Along Highway 93</li> <li>• Along Bitterroot River</li> <li>• Walking path through fishing access point</li> <li>• Woodside Cutoff</li> </ul>

## Darby

Desirable trail system connection points	Potential trail system linkage routes
<ul style="list-style-type: none"> <li>• Lake Como</li> <li>• Tin Cup trailhead</li> <li>• Trapper Creek and Trapper Peak access</li> <li>• Town parks</li> <li>• Schools</li> <li>• Bitterroot River</li> <li>• Countywide trails system</li> </ul>	<ul style="list-style-type: none"> <li>• North/south routes (off Highway 93 where possible)</li> <li>• Routes along Forest Service roads in to West Fork area</li> <li>• Link between Lake Como and Tin Cup area</li> </ul>

## Hamilton

Desirable trail system connection points	Potential trail system linkage routes
<ul style="list-style-type: none"> <li>• Main Street</li> <li>• Schools</li> <li>• Golf course</li> <li>• Bitterroot River crossings</li> <li>• Lake Como</li> <li>• Fairgrounds</li> </ul>	<ul style="list-style-type: none"> <li>• Closely followed roads and rivers</li> <li>• Link town center with Highway 93 and Eastside Highway</li> <li>• Alternative north/south routes off of highways</li> <li>• Continue Highway 93 trail past Angler's Roost</li> </ul>

The information collected seems to indicate that residents of Ravalli County are most interested in developing two broad types of trails systems in the County:

1. Trails primarily for transportation purposes, generally running along north/south corridors, that corridors that can be used to access activity centers such as schools, work, and shopping.
2. Trails primarily for recreational purposes, generally running east/west, from the town centers towards the Bitterroot River and its larger tributaries; rural lands; and the Bitterroot and Sapphire mountain ranges.



## EXISTING RESOURCES

To date, parks and trails considerations have primarily been administered in Ravalli County by two entities: The Ravalli County Park Board and the Ravalli County Planning Department.

The most recently adopted priorities of the Planning Department do not include a specific provision for a trails program, although programs of that sort are sometimes housed as an arm of the local planning department. The Park Board is strictly a volunteer advisory board which serves at the pleasure of the Board of County Commissioners on issues related to parks and recreation. A close examination of existing priorities and responsibilities would need to be undertaken if either entity were tasked with the full administration of a trails program.

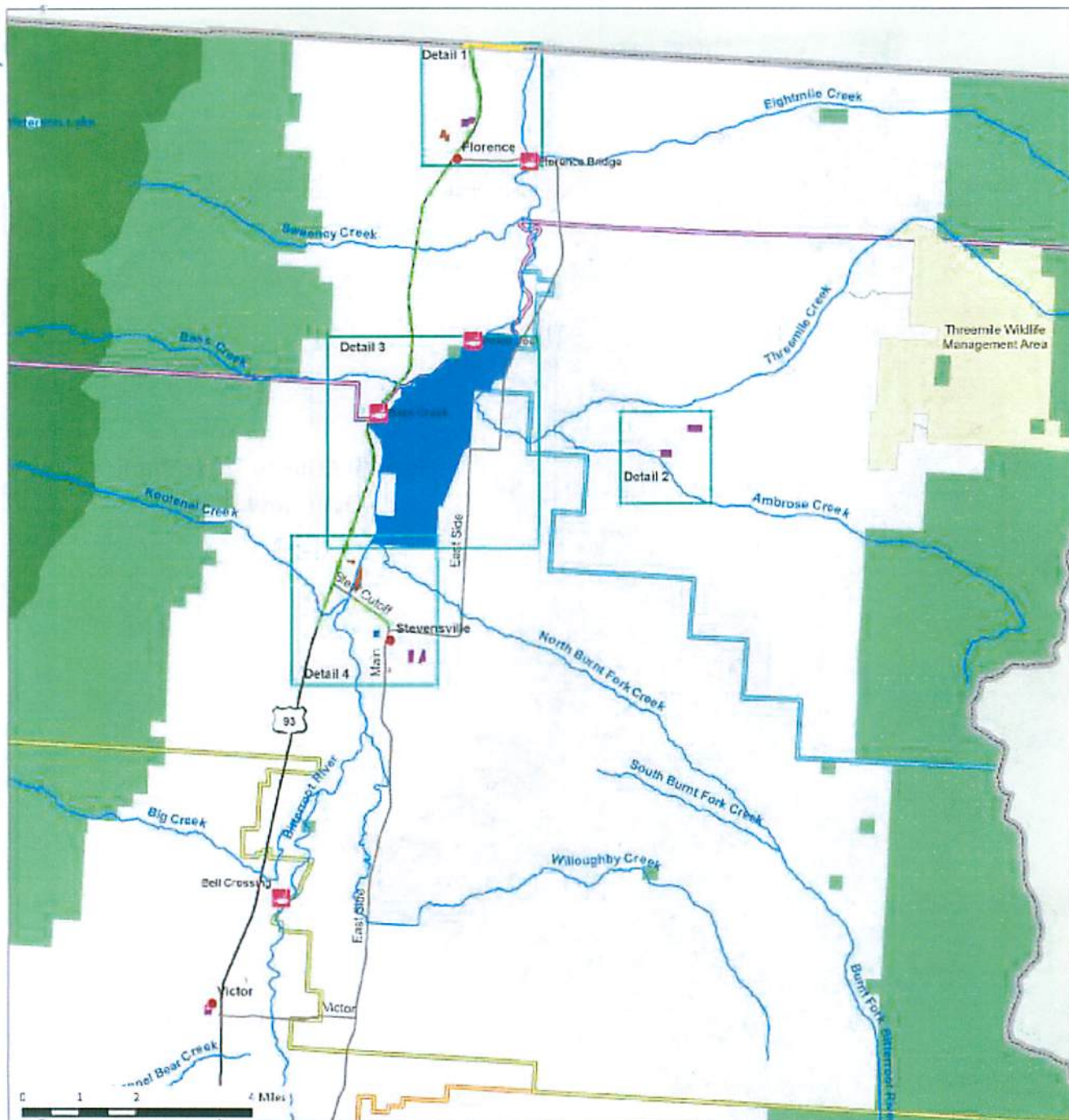
Additionally, there have been organized efforts by citizens to implement trails on a localized scale. In some communities a non-profit organization will be primarily responsible for a trails program, although, to date in Ravalli County, it does not appear that such an organization exists.

The County should carefully consider the extent of existing resources prior to the implementation of a trails system. A viable trails system will only be achieved if

there is sufficient support, financial and public, for short-term implementation as well as long-term maintenance. Within the current prioritization of resources it appears that the ability to fully implement a trail system effectively may be limited.





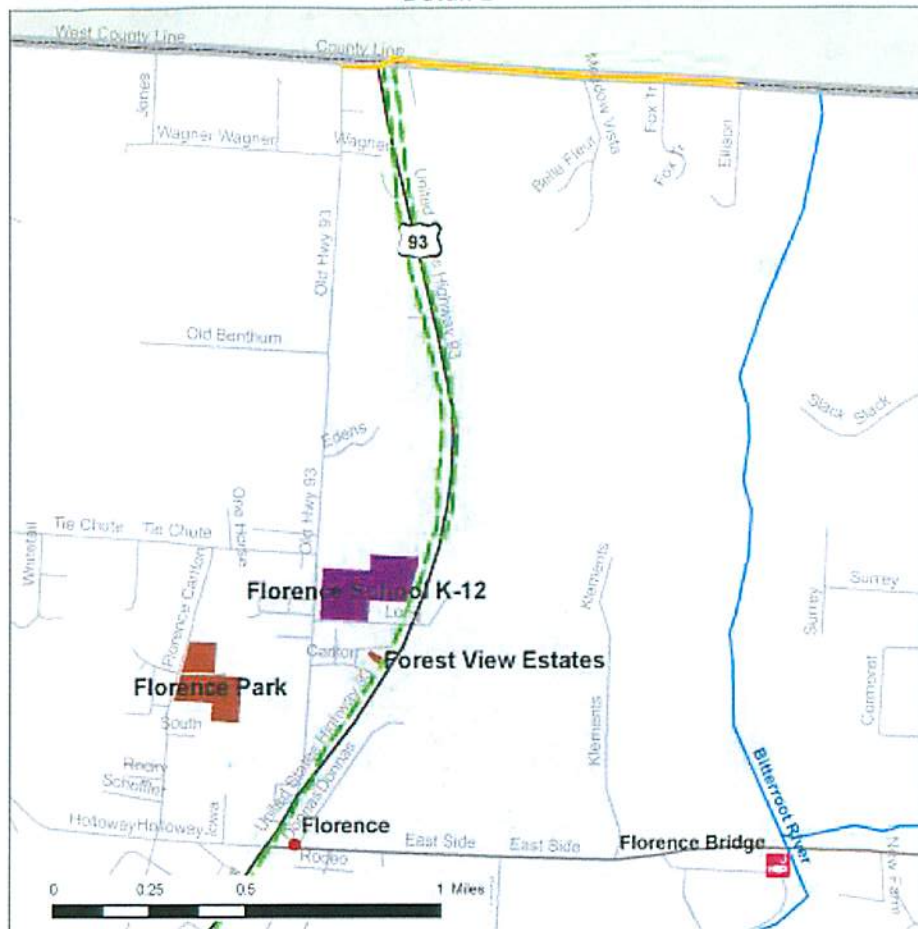


# Florence Carlton, Lone Rock, and Stevensville School Districts Existing Parks, Trails and Desirable Connection Points

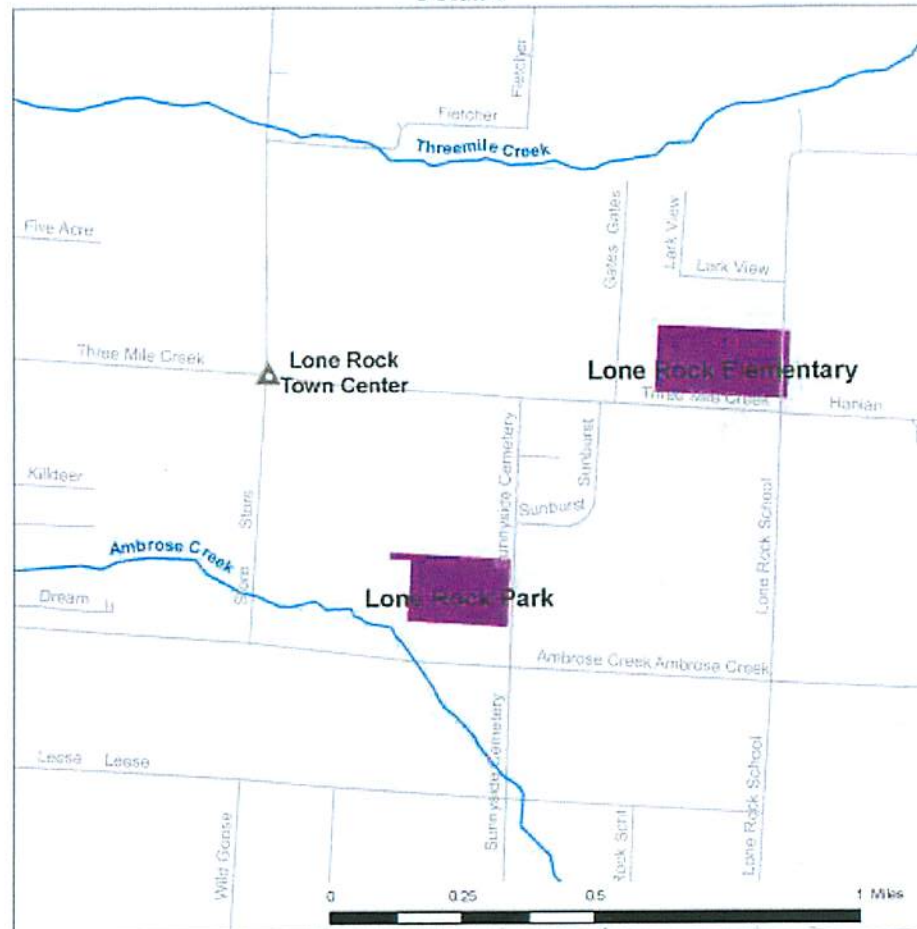
Map is for general planning purposes only

- | Legend                       |                              |                                       |
|------------------------------|------------------------------|---------------------------------------|
| Park Lands in Ravalli County | MDT Walkway/Bike Path        | Florence Carlton School District      |
| Park Ownership Class         | Chief Looking Glass Road     | Lone Rock School District             |
| US                           | US Highway                   | Stevensville School District          |
| County                       | State and Secondary Highways | Other Ravalli County School Districts |
| City/ Town                   | Streams                      | U.S. Forest Service Wilderness Areas  |
| School                       | Lakes                        | U.S. Forest Service                   |
| Fishing Access Sites         | Map Detail                   | Ravalli County Boundary               |
| Wildlife Management Areas    |                              | Cities and Towns                      |

Detail 1



Detail 2



Florence Carlton and Lone Rock School Districts  
Existing Parks, Trails and  
Desirable Connection Points  
Details 1 and 2

### Legend

Park Lands in Ravalli County

Park Ownership Class

US

County

City/Town

School

Fishing Access Sites

Chief Looking Glass Road

MDT Walkway/Bike Path

US Highway

State and Secondary Highways

Other Roadways

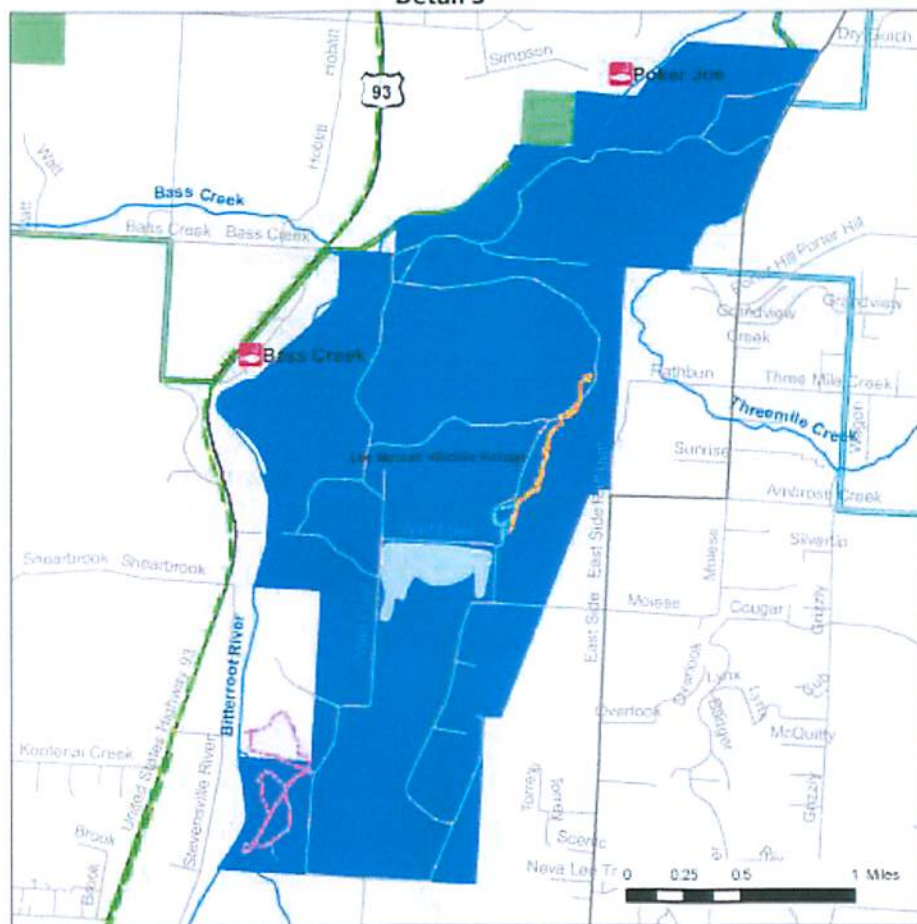
Streams

Ravalli County Boundary

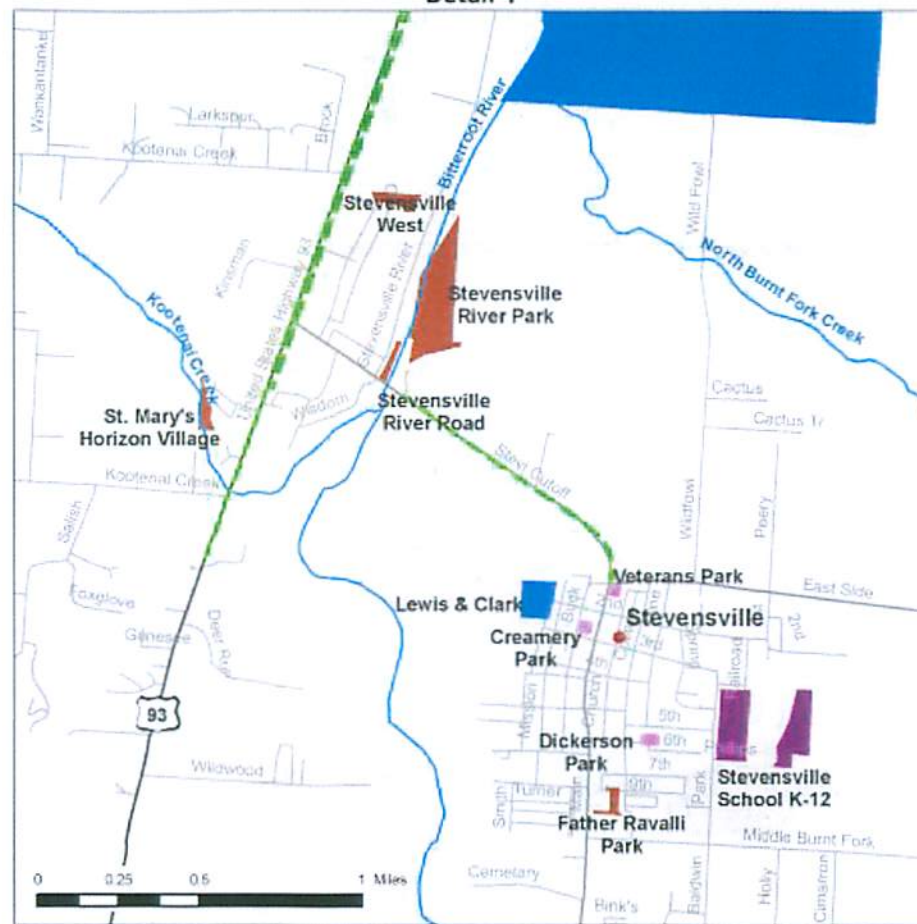
Cities and Towns



Detail 3



Detail 4



**Stevensville School District  
Existing Parks, Trails and  
Desirable Connection Points  
Details 3 and 4**

**Legend**

Park Lands in Ravalli County

Park Ownership Class

US

County

City/ Town

School

Fishing Access Sites

Kenai Nature Trail

Kenai Nature Trail-Accessible portion

Wildlife Viewing Area Trail

MDT Walkway/Bike Path

US Highway

State and Secondary Highways

Other Roadways

Streams

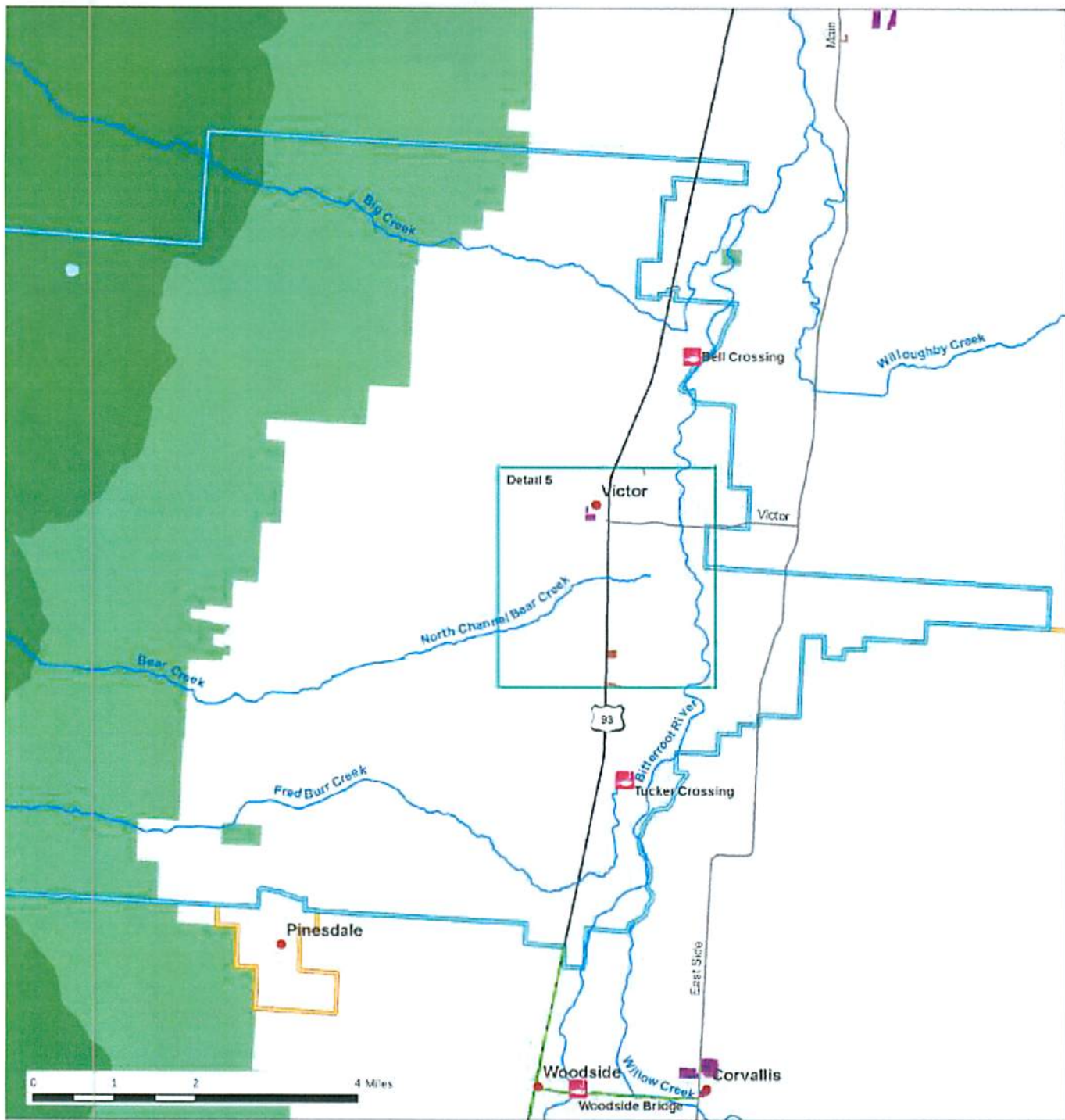
Lakes

Lone Rock School District

Stevensville School District

U.S. Forest Service

Cities and Towns

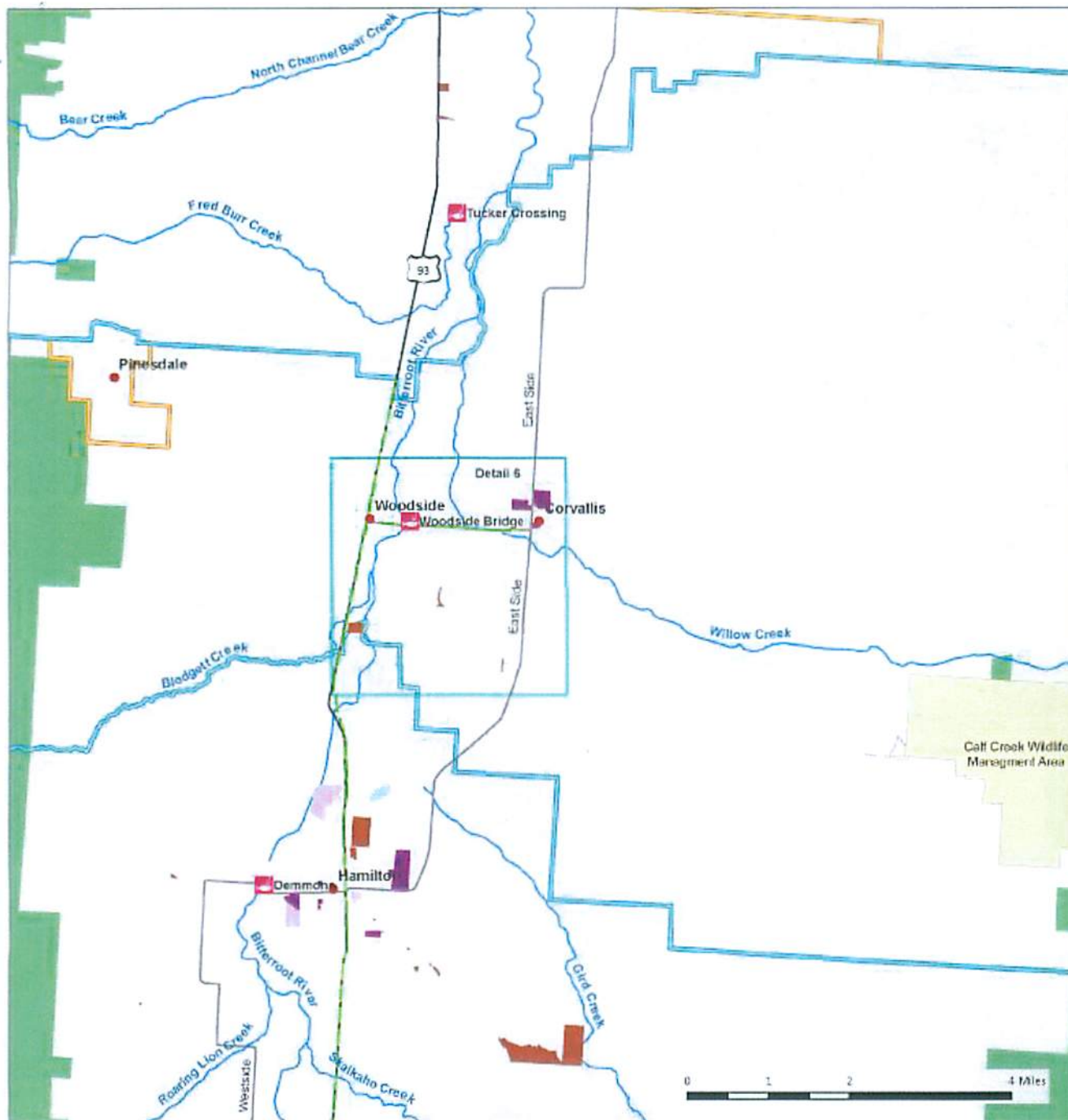


# Victor School District Existing Parks, Trails and Desirable Connection Points

Map is for general planning  
purposes only

- |   |   |   |
|---|---|---|
| <p>Park Lands in Ravalli County</p> <p>Park Ownership Class</p> <ul style="list-style-type: none"> <li><span style="color: blue;">■</span> US</li> <li><span style="color: brown;">■</span> County</li> <li><span style="color: purple;">■</span> City/Town</li> <li><span style="color: red;">■</span> School</li> </ul> | <p><span style="color: red;">■</span> Fishing Access Sites</p> <p><span style="color: green;">—</span> MDT Walkway/Bike Path</p> <p><span style="color: black;">—</span> US Highway</p> <p><span style="color: black;">—</span> State and Secondary Highways</p> <p><span style="color: blue;">—</span> Streams</p> <p><span style="color: lightblue;">■</span> Lakes</p> | <p><span style="border: 1px solid black; padding: 2px;"> </span> Map Detail</p> <p><span style="border: 2px solid blue; padding: 2px;"> </span> Victor School District</p> <p><span style="border: 2px solid orange; padding: 2px;"> </span> Other Ravalli County School Districts</p> <p><span style="background-color: green; width: 10px; height: 10px;"></span> U.S. Forest Service Wilderness Areas</p> <p><span style="background-color: lightgreen; width: 10px; height: 10px;"></span> U.S. Forest Service</p> <p><span style="color: red;">●</span> Cities and Towns</p> |
|---|---|---|





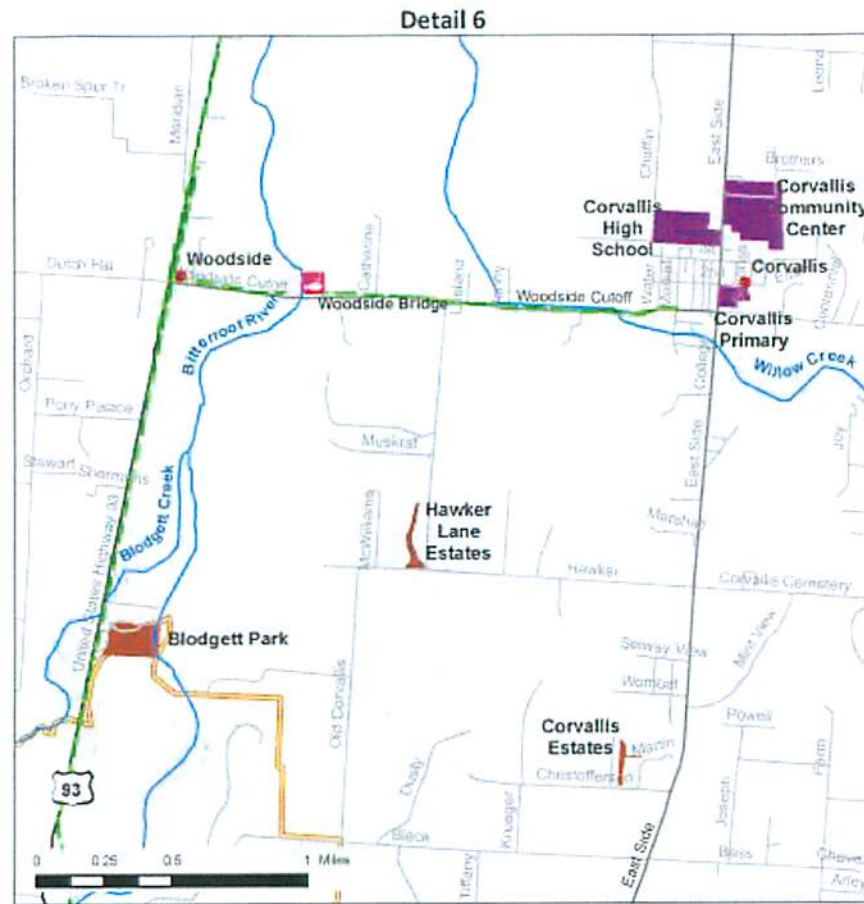
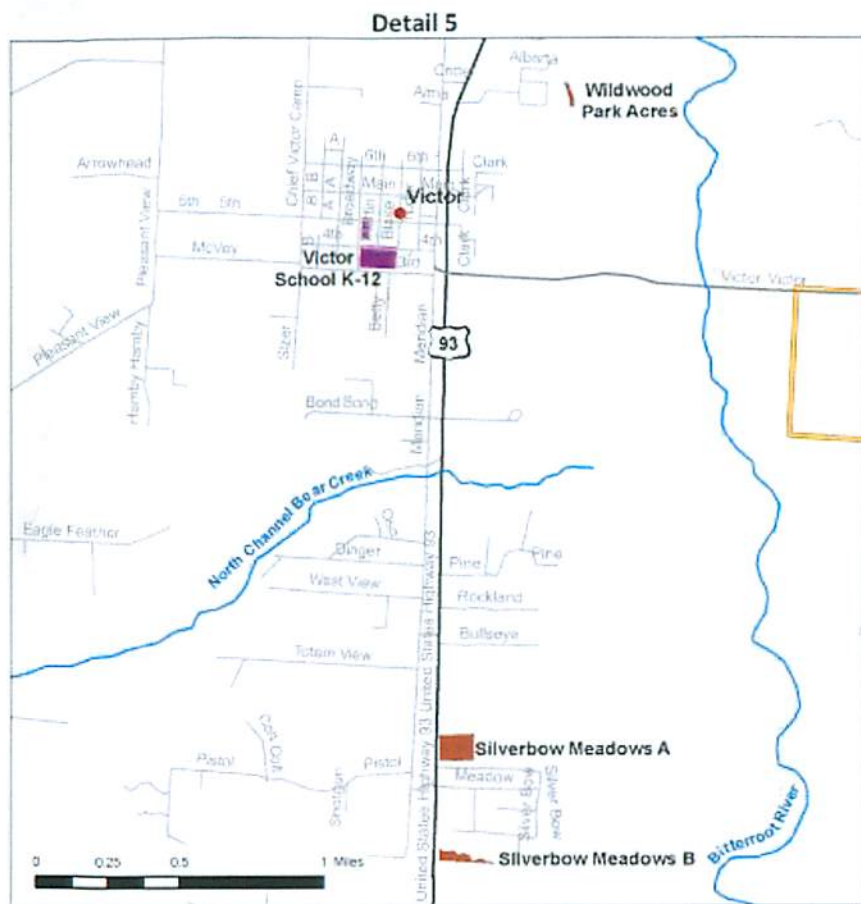
**Corvallis School District  
Existing Parks, Trails and  
Desirable Connection Points**

Map is for general planning  
purposes only

**Legend**

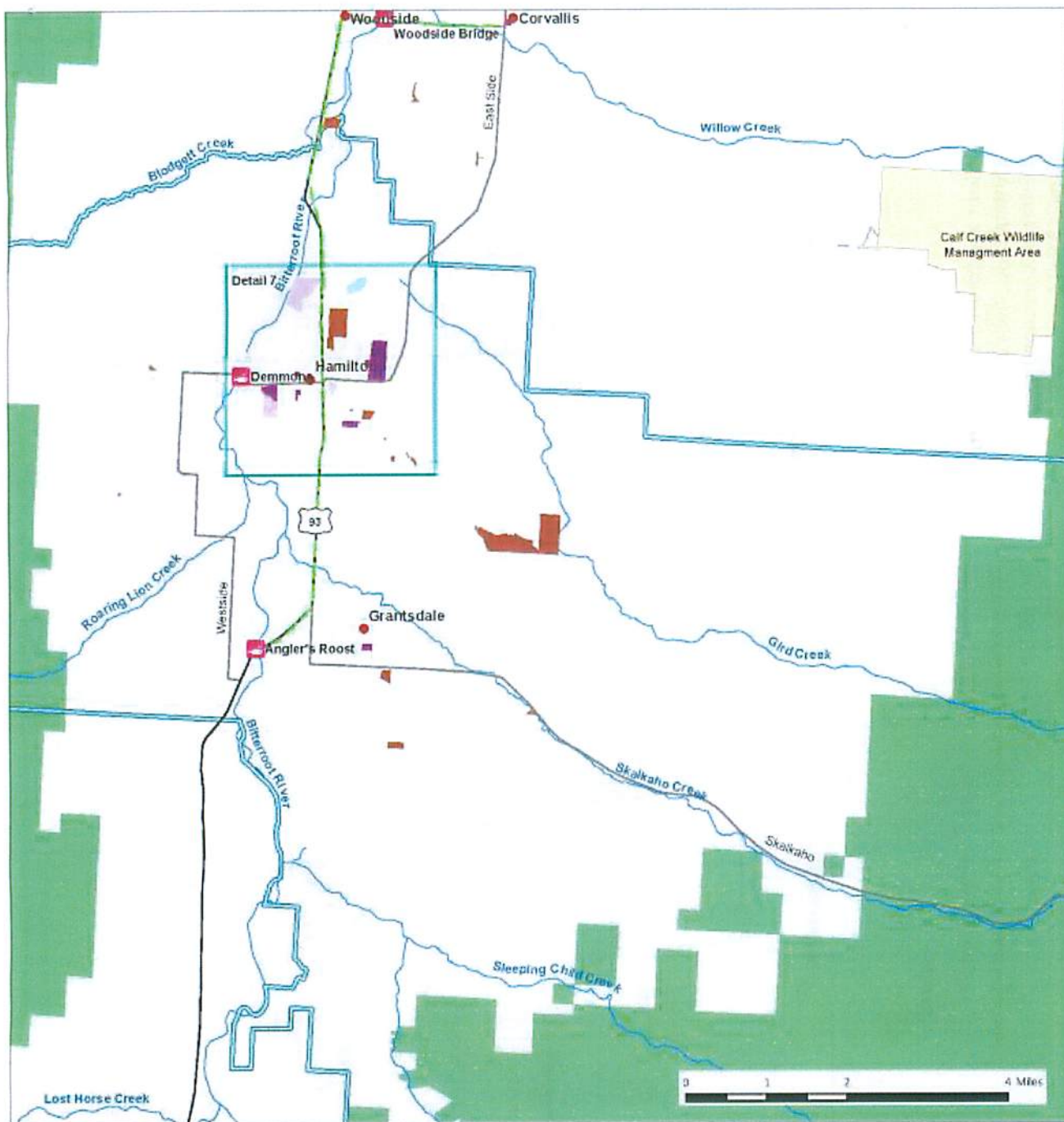
- |                              |                             |                                       |
|------------------------------|-----------------------------|---------------------------------------|
| Park Lands in Ravalli County | MDT Walkway/Bike Path       | Corvallis School District             |
| Park Ownership Class         | US Highway                  | Other Ravalli County School Districts |
| US                           | State and Secondary Highway | U.S. Forest Service Wilderness Areas  |
| County                       | Streams                     | U.S. Forest Service                   |
| City/ Town                   | Lakes                       | Cities and Towns                      |
| School                       | Map Detail                  |                                       |
| Fishing Access Sites         |                             |                                       |
| Wildlife Management Areas    |                             |                                       |





**Victor and Corvallis School Districts  
Existing Parks, Trails and  
Desirable Connection Points  
Details 5 and 6**

- Legend**
- |                              |                              |                                 |
|------------------------------|------------------------------|---------------------------------|
| Park Lands in Ravalli County | Fishing Access Sites         | Streams                         |
| Park Ownership Class         | MDT Walkway/Bike Path        | Lakes                           |
| US                           | US Highway                   | Ravalli County School Districts |
| County                       | State and Secondary Highways | Cities and Towns                |
| City/Town                    | Other Roadways               |                                 |
| School                       |                              |                                 |



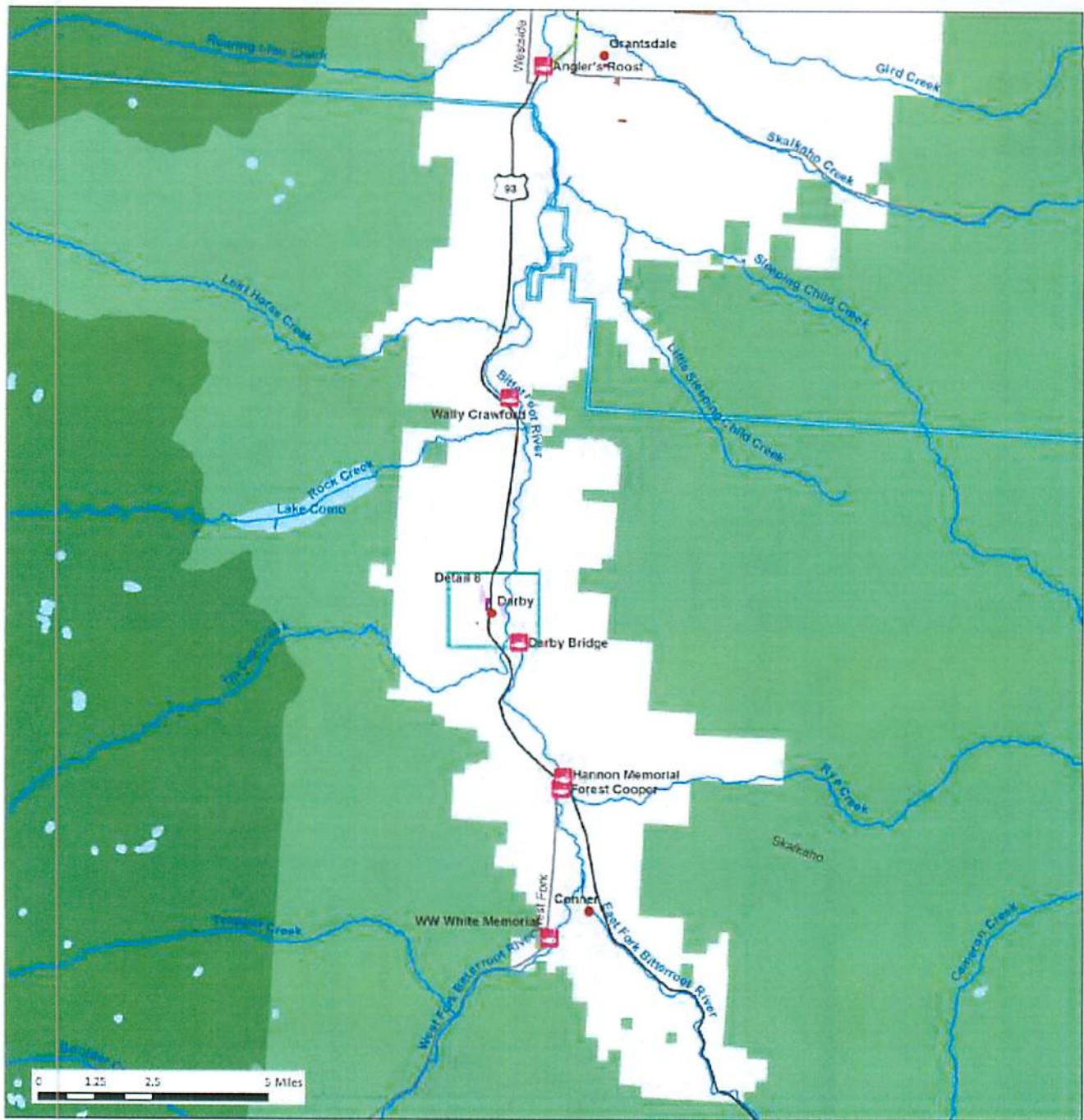
### Hamilton School District Existing Parks, Trails and Desirable Connection Points

Map is for general planning  
purposes only

#### Legend

- |                              |                              |                          |
|------------------------------|------------------------------|--------------------------|
| Park Lands in Ravalli County | Fishing Access Sites (MFWP)  | Map Detail               |
| Park Ownership Class         | Wildlife Management Areas    | Streams                  |
| US                           | MDT Walkway/Bike Path        | Lakes                    |
| County                       | US Highway                   | Hamilton School District |
| City/Town                    | State and Secondary Highways | U.S. Forest Service      |
| School                       |                              | Cities and Towns         |



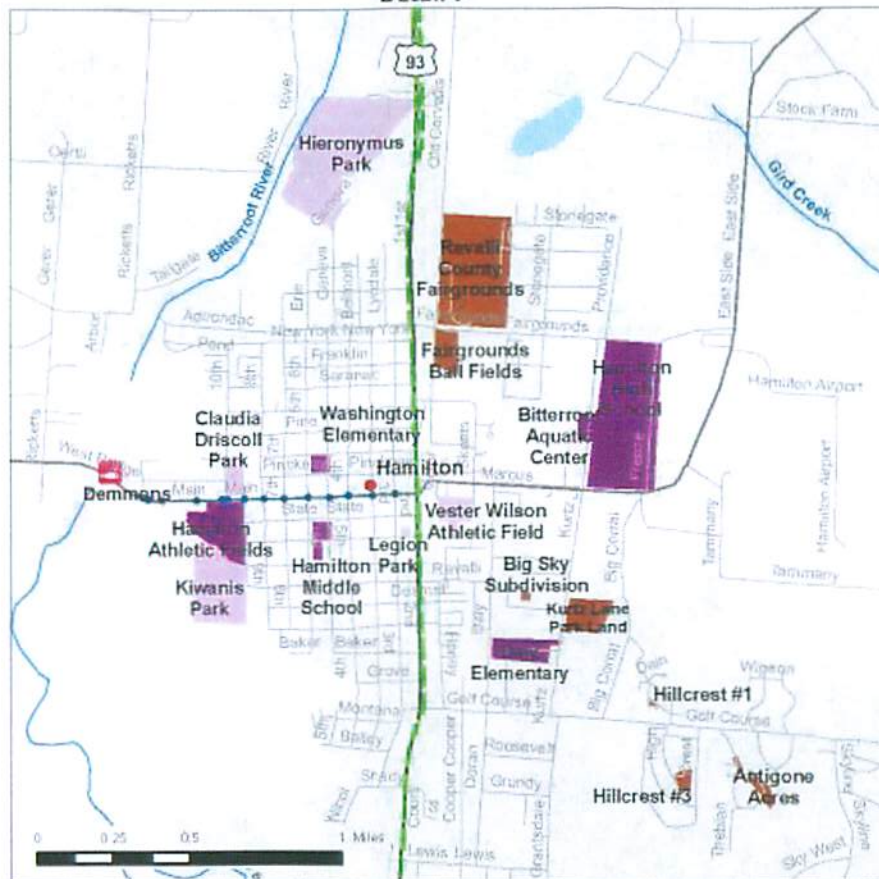


# Darby School District Existing Parks, Trails and Desirable Connection Points

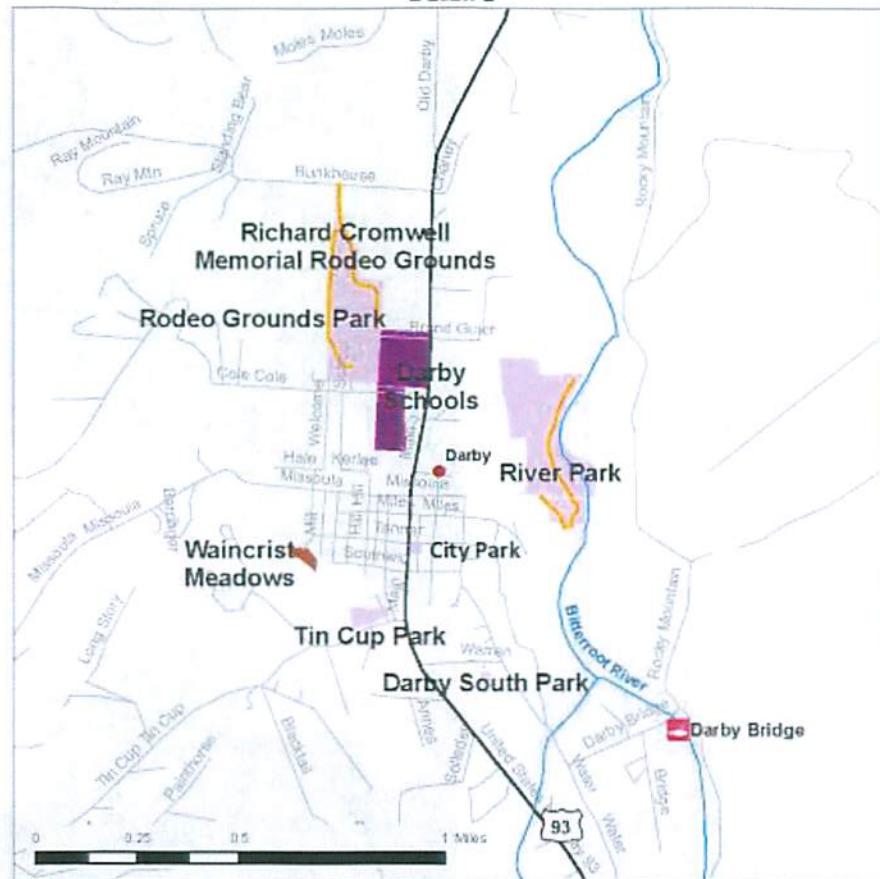
Map is for general planning  
purposes only

- | Legend                       |                              |                                      |
|------------------------------|------------------------------|--------------------------------------|
| Park Lands in Ravalli County | Fishing Access Sites         | Streams                              |
| Park Ownership Class         | MDT Walkway/Bike Path        | Lakes                                |
| US                           | US Highway                   | Darby School District                |
| County                       | State and Secondary Highways | U.S. Forest Service Wilderness Areas |
| City/ Town                   | Map Detail                   | U.S. Forest Service                  |
| School                       |                              | Cities and Towns                     |

Detail 7



Detail 8



**Hamilton and Darby School Districts  
Existing Parks, Trails and  
Desirable Connection Points  
Details 7 and 8**

Park Lands in Ravalli County

Park Ownership Class

US

County

City/ Town

School

Fishing Access Sites

Darby Trails

MDT Walkway/Bike Path

Main Street, Hamilton

US Highway

State and Secondary Highway

Other Roadways

Streams

Lakes

Cities and Towns

# KEYS TO SUCCESS

Examples of successful community trail systems throughout the country have a number of shared characteristics. A 'successful' trail system in this instance is one that meets the needs of the community, is supported by the community, and has long-term viability. Decision makers in Ravalli County are encouraged to closely consider these keys to success when preparing to implement the Ravalli County Trails Plan.

Common characteristics of successful programs include:

- Having a clear plan to address maintenance and land stewardship issues;
- Acquiring a secure funding source for implementation and maintenance;
- Having a formalized group that can advocate for trails and keep the momentum of a trail program going;
- Developing and following clear objectives and standards;
- Integrating trail planning into other community planning processes (i.e. transportation plans, subdivision review, etc);
- Involving the public at all levels of planning and implementation;

- Building upon existing community trail systems and places of interest (i.e. schools, parks, etc);
- Having available staff and experts skilled in topics related to trail development and procurement.

For detailed examples of successful trail programs please see appendices A, B, and C.



# RECOMENDATIONS

## GOALS AND POLICIES

The goals and policies were developed for the Ravalli County Trails Plan after careful consideration and review of the trails planning public involvement process, existing public perception documents, and the existing best standards and practices. The goals and policies are intended to describe the essential purpose of a trails initiative, as well as to lead specific implementation efforts. Decision makers are encouraged to refer to these goals and polices when developing and implementing trail related activities.

**Goal 1** To build and maintain cohesive communities within Ravalli County and positive relationships with surrounding areas by:

Policy 1.1 developing a non-motorized comprehensive trail system that connects neighborhoods, schools, businesses, parks, and other public spaces of the Bitterroot Valley;

Policy 1.2 linking the Bitterroot Valley with neighboring communities and outlying areas, including the national forest, Missoula County, Bitterroot/Selway

wilderness area, and the Sapphire Mountains through a comprehensive non-motorized trail system;

Policy 1.3 encouraging trail system users to show respect towards other trail users and neighboring landowners through education and outreach efforts;

Policy 1.4 planning and providing for long term trail maintenance responsibilities thereby limiting future discord and difficulties.

**Goal 2** To promote and encourage recreational, health, and fitness opportunities by:

Policy 2.1 providing an easily accessible non-motorized trail system in Ravalli County that allows for a variety of activities, skill levels, and types of experiences.

**Goal 3** To protect the wildlife habitat and ecological attributes that make Ravalli County a desirable place to live and visit by:

Policy 3.1 encouraging trail users to value the ecological systems that the trails link or traverse by promoting environmental awareness;

Policy 3.2 siting trails, when appropriate, with access to and connections between the Bitterroot River, Highway 93, and other linear areas of open space, while preserving wildlife habitat and other valuable ecological services provided by these corridors; and

Policy 3.3 avoiding environmentally sensitive areas and limiting impact on local wildlife and natural resources.

**Goal 4** To increase economic development opportunities in Ravalli County by:

Policy 4.1 creating a comprehensive trail which will be attractive to cyclists, equestrians, and other trail users in order to help make the Bitterroot Valley a vacation destination;

Policy 4.2 retaining and attracting new business which can service trail users

Policy 4.3 implementing a trail system that will help maintain the rural character and recreational amenities of the County, contributing to a stronger housing market and increased property values, in particular along trail corridors;

Policy 4.4 planning and providing for long term trail maintenance responsibilities thereby reducing the financial burden on future generations.

**Goal 5** Respect and protect the rights of Ravalli County residents, especially trail-side landowners, by:

Policy 5.1 locating trail corridors on public lands and public rights-of-way, to the greatest extent possible;

Policy 5.2 ensuring that new residential development contributes its fair share to the community system of trails and pathways through incentives in the subdivision review process;

Policy 5.3 limiting new tax burden on current and future residents, to the extent possible, by seeking funding or trail system development and maintenance through outside funding sources and voluntary contributions;

Policy 5.4 encouraging trail users to value the rights of trailside landowners through educational awareness efforts and promotion of peer monitoring; and

Policy 5.5 carefully analyzing and providing for long-term maintenance in any trail planning project.

## TRAIL IMPLEMENTATION PRIORITIES

### **Highest Priority:**

*Adoption of the trails plan by Ravalli County is the first step in making a trail system a reality. Non-governmental organizations, citizens, and businesses can be partners in the process of implementing and maintaining a trail system most easily if the local government has officially adopted the Plan. Even within this initial step it is recommended that County officials recognize that simply adopting the trails plan will not make it a reality.*

Implementation funding, long term maintenance costs, and public support must all be weighed, however adoption of the plan is the first step in this process.

### **Secondary Priorities:**

*Incorporate the Ravalli County Trails Plan into the Ravalli County Master Parks and Recreation Plan and into the subdivision review process.* By officially adopting this trails plan and incorporating it into subdivision review, the County can maximize the opportunity for future subdivisions to comply with and connect to the proposed trail system. Often, proposed trails are considered high priority if they are needed to satisfy present demand, correct an unsafe situation, or secure access that is in jeopardy of development. Some trails can become realities as part of development projects. Decision makers should consider both the development of trails as well as simply the securing of easements for future development of trails within the subdivision process.

*Develop a formalized process for weighing considerations related to implementation costs and long term maintenance responsibilities.* A formalized process for evaluating implementation cost and long term responsibilities will help the County determine if they are able to take on the responsibilities of maintenance associated with a particular trail segment in order to help guarantee viability. It is critical that the funding authority, both for

immediate implementation and long term maintenance, be established prior to the acquisition of a trail.

*Require land dedication as opposed to cash-in-lieu, whenever appropriate, to satisfy the parkland dedication requirements of subdivision review.* The County Park Board or another administrative body should be tasked with maximizing the use of these lands for parks and trails.

*Publish and distribute a trails map* to encourage use and promote development of the trails system.

### **Additional Priorities:**

*Coordinate trails development with the School Districts.* Opportunities may exist to jointly plan and develop trails used by children walking or biking to school, and to improve the safety, efficiency and convenience of school drop-off zones. School district participation could include direct funding contributions, use of school district lands, or trail maintenance on segments near schools. Montana's Nutrition and Physical Activity Program can assist the city and county in conducting planning workshops for safe routes to schools.

*Coordinate trails development with the health community.* Close-to-home physical activity, especially when incorporated into people's everyday activities, can have a dramatically positive effect on health. Much research has

linked the nation's obesity epidemic to a lack of physical exercise. Health care practitioners, clinics, and insurance providers have become actively involved around the country in developing trails as a health initiative.

*Explore the potential for railbanking.* Portions of the Highway 93 corridor that are not slated to be linked by the Highway 93 bikepath (Angler's Roost to Darby) can be constructed on the existing railbed if a railbanking agreement can be negotiated.

*Incorporate adopted trails plan into future County transportation planning and capital improvement programs.* On-street non-motorized transportation enhancements such as bike lanes, bike routes, traffic calming devices and community walkability improvements should be considered transportation infrastructure on equal footing with, and considered at the same time as, planning for motor vehicle traffic.

## TRAIL IMPLEMENTATION: RECOMMENDED ACTIONS

Along with the adoption of the trails plan, a first step to implementing a trail system may be to identify a local group, organization, County Board, or County Department that can act as the steward of the trails plan and facilitate the implementation the plan and determine the resources necessary for long term maintenance. This institutional capacity will support and coordinate local community trail planning efforts. Ravalli County decision makers should consider what resources will be necessary for this administrative body to function and if these resources exist.

This administrative body may consider beginning trail development by linking existing trails and parks along public rights of way. This will increase the visibility of and demand for a trails system without requiring the acquisition of new lands.

Based on the public input that was received during the development of this plan, linking existing schools and parks with town and population centers should be a high priority. In many instances this will only be accomplished through close cooperation with local municipalities, however additional partnerships could lend longevity to

the project as well as increase opportunities for outside funding.

Simultaneously, trail system administrators should consider implementing a mechanism to secure easements on new developments for future trail routes, most likely through the subdivision review process. Developers should be encouraged to work with the County early in their planning process to identify potential sites for trail development or easements for future development.



# TRAIL SYSTEM IMPLEMENTATION CONSIDERATIONS

New trails being considered for Ravalli County can provide non-motorized transportation routes, public access corridors, multi-use recreation facilities, buffers for sensitive natural resources, and avenues for interpretation and education about natural and cultural features. However, a number of factors should be addressed when evaluating the relative value of any proposed trail or trail location. As a starting point, the following sections cover many of topics that should be used when assessing and prioritizing trail development efforts.

## POTENTIAL BENEFITS OF TRAILS

Communities with comprehensive trail systems often find that trails enrich their community in a number of ways. A single, well-designed trail could and should provide many types of benefits; however, planners and decision makers may find it useful to understand some of the more

common benefits they could expect in order to inform the decision making and prioritization process. The following section outlines some potential benefits of trails for consideration.

### **Human and Cultural Benefits**

*Enhances Non-Motorized Transportation.* Trails can provide commuter connections for bicyclists and pedestrians between neighborhoods and community amenities such as commercial centers, businesses, schools, and parks.

*Complements Existing Transportation Networks.* Trails can interconnect, complete, or extend existing community trail systems and transportation networks. Long-distance trails that connect town and community centers with outlying communities and subdivisions in the county should be highly valued.

*Supports Non-Motorized Recreation.* Trails can support a variety of recreational uses such as hiking, running, bicycling, horseback riding, and other forms of exercise. Though not all types of use can be accommodated on all trails, higher priority should be given to trails that support a variety of uses.

*Improves Safety.* Well-designed trails can significantly improve safety by separating motor vehicles and trail users.

*Provides Views.* Trails can offer impressive views and ambiance for residents and visitors.

*Supports Educational Uses.* Trails that can allow users the opportunity to view, study, and interact with the wildlife and plant-life of an area, or to learn more about local history and culture, are regarded as more valuable to the community as a whole.

*Provides Access for Persons with Limited Mobility.* An accessible trail can allow for a variety of uses and users, and can provide access into rural and wildlife areas for persons who might otherwise be challenged in accessing these areas. Accessible trails must meet a number of specifications pertaining to width, passing space, surface, slopes, clearance, rest areas, and signs.

*Makes Use of Existing Corridors.* Natural and existing travel routes for humans and wildlife may include: road and utility rights-of-way, informal social paths, watercourses, drainages, and ridges. Pre-planned trail alignments within new subdivisions also offer valuable routes through newly developing areas. These pre-existing corridors provide opportunity to create continuous trail alignments without crossing private land and have the means to utilize common pathways.

*Public Support/Demand.* A trail should be in high demand and is perceived as a positive asset to the community.

*Seizes Available Opportunity.* Trail projects should be organized to take advantage of present opportunities in order for the trail network to continue expanding efficiently. By seizing currently available opportunities, time and energy later spent negotiating trail easements will be alleviated.

### **Ecological Benefits**

*Protects Environmental Features.* Wetlands, stream corridors, native vegetation, natural landscapes, and wildlife habitat are examples of environmental features that may be preserved by proper selection of a trail corridor. Trail placement may serve as a safeguard against potential intrusions by other, more harmful land uses.

*Connects Fragmented Lands.* A trail corridor may serve to connect and preserve these portions of undeveloped land, which in turn, protects native habitats, landscapes, and wildlife travel routes.

*Diminishes Air/Water Pollution.* Non-motorized travel diminishes air pollution. Water pollution can also be lessened by the sensitive placement of a trail corridor near a waterway, creating a protected greenway. This type of linear buffer protects vegetation and decreases damage from impacts such as soil erosion and chemical run-off.

## **Economic Considerations & Benefits**

*Easily Secured Easements.* The ability to acquire land, when necessary, and the financial commitment involved must always be considered.

*Available funds.* Securing construction funds early in the planning and development process should be a high priority for any trail project.

*Ease of Maintenance.* A successful maintenance program requires routine care and consistent involvement. This kind of attention not only ensures trail safety, but also prolongs the life of the trail. Good planning minimizes safety and maintenance problems later. A budget and maintenance plan, including weed management, should be developed during the phase, with the entity responsible for maintenance identified.

*Stimulates Economic Development.* A trail that draws visitors and residents out of their automobiles for a bike ride, horseback ride, picnic, or walk, also provides an economic opportunity for the community. Property values of land along trail corridors often increase, further stimulating economic growth.

*Ease of Access to Trail.* Depending on the amount of use and location, a trailhead may need parking space for vehicles or simply an adequate visual distinction for pedestrians or bicyclists.

For more information on the economic benefits of trails, their effect on neighborhoods, and home values please see appendices D, E, F, and G.

## **TYPES OF TRAILS**

Successful implementation of a trail system in Ravalli County will likely include several types of trails for recreational as well as non-motorized transportation purposes. The trail experience offered and type of user accommodated (bicyclist, equestrian, pedestrian, roller-bladder, jogger, wildlife watcher, etc.) will vary depending on trail width and surface; corridor character; and the presence, volume, and speed of motor vehicle traffic. Planners and decision makers should carefully consider the type of experience they intend a trail to provide when deciding on the type of trail to establish.

**Pathways.** Pathways are physically separated from motorized vehicular traffic by open space or a barrier, and can be located either inside a road right-of-way or within an independent right-of-way. Pathways can offer opportunities not provided by the road system, such as recreation in a natural setting. They also can provide safe and direct commuter routes that preclude motor vehicles,

circumvent obstacles, and connect community features. Linear open spaces such as streams, rail corridors, and utility corridors can provide excellent locations for pathways.

Pathway widths and surfaces will vary depending on the type and volume of use expected, and the experience desired. Class 1 trails are 8-10 feet wide, with a paved or gravel surface, and are appropriate in situations of high use and multiple types of users. Class 2 trails are 5-6 feet wide, and are generally gravel. Class 3 trails are suitable in natural settings and might be 18-inch natural surface paths. All off-road pathways should be sited within a trail corridor with a minimum width of 25 feet to ensure adequate room for trail construction, maintenance and use. Trail corridors may either be a public dedicated right-of-way or a public easement.

**Greenways** are pathways through linear corridors of protected open space, most notably along rivers and streams.

See Appendix H for a more detailed description of pathway types and design standards.

**Shared Roadways.** Most bicycle travel in the United States occurs on roads shared with motor vehicles. Montana statutes (61-8-602 MCA) make bicyclists legitimate road users, and the presence of bicyclists

should be expected on all roads. Pedestrians will also walk along roads when sidewalks or separated pathways have not been provided.

The American Association of State Highway and Transportation Officials' (AASHTO) "Guide for the Development of Bicycle Facilities", revised in 1999, is the principal resource for bicycle facility design in the United States and has been adopted by many state and local governments. The guide discusses general design characteristics of roadway improvements for bicycles and identifies design standards for pathways used by bicyclists. Minimum design standards are provided only where further deviation would result in unacceptable safety compromises.

See Appendix B for AASHTO design standards for a typical bike lane.

Bike lanes are corridors designated for the exclusive use of bicyclists. They are generally established on urban arterials or collector streets, where there is significant bicycle demand and where motor vehicle speeds are relatively high. Bike lanes are delineated with striping and other identifying pavement markings. Bike lanes are one-way facilities, optimally 4-5 feet wide, with a bike lane on each side of the road.

Bike lanes are intended to delineate the right of way assigned to bicyclists and motorists and to provide for



more predictable movements by each. They can increase the total capacity of roads carrying mixed bicycle and motor vehicle traffic. Bike lanes often are established where insufficient space currently exists for safe and comfortable bicycling on existing streets. Bike lanes may be created without widening the paved surface by reducing existing travel lane widths or by prohibiting parking. Vegetated boulevards (the area between the street and sidewalk) sometimes can be reconfigured to provide pocket parking to make more room for on-street travel.

Bike routes are preferred routes along high-demand bicycle corridors that are signed to guide bicyclists and to alert motorists. Bike routes provide linkages between discontinuous pathways and bike lanes, and can direct bicycle traffic onto low-volume roads or those with a paved shoulder. These routes are attractive to bicyclists because they provide efficient, safe travel corridors that connect common destination areas across the community. In more rural settings, where sidewalks are absent, pedestrians will also use these same roadway shoulders, since they often are the only routes available.

Factors that affect the suitability of a road for a bike route include gradient, alignment, paved surface width, pavement condition, traffic volume and traffic speed. Shared roadways designated as bike routes should be constructed or improved to standards that allow for safe,

non-motorized use. Width is the most important variable affecting the ability of a roadway to safely accommodate bicyclists and pedestrians alongside motorists.

All bike routes should be signed in accordance with the Manual on Uniform Traffic Control Devices (MUTCD), and signage should include information on direction and destination to encourage use. This is especially important where it is recommended that bicyclists follow a routing that differs from the routing recommended for motorists. Bike routes should not end at a barrier, such as a major intersection.

Two common methods of increasing roadway width where needed along bike routes are to provide wide curb lanes or paved shoulders.

Wide curb (outside) lanes are preferred where shoulders are not provided, such as in the city core where the street section includes curbs and gutters. Where parking is prohibited, paved curb lane width should be at least 12 feet but not more than 15 feet to accommodate both motorists and bicyclists. Lanes wider than 15' are not recommended because they may encourage the undesirable operation of two vehicles in one lane. Wide curb lanes allow motorists to pass without changing lanes and provide more room for last minute maneuvering. Wide curb lanes sometimes can be provided by restricting parking and/or narrowing inside travel lanes.

On-street parking along bike routes increases the potential for conflicts between motorists and bicyclists, since bikers tend to ride in the area between parked and moving cars. Here, bicycles are subjected to opening car doors, vehicles exiting parking spaces, and obscured views of traffic. Therefore, 12' of combined width for bicycle travel and car parking should be provided along high-traffic bike routes.

Paving road shoulders usually is a more appropriate solution in rural situations, and can improve safety and user experience along more heavily traveled and higher-speed roads. Similar to wide curb lanes, paved shoulders provide increased width for non-motorized traffic. Paved shoulders can extend the service life of the road surface since edge deterioration can be significantly reduced. They also can provide a breakdown area for motor vehicles. Paved shoulders should be at least 4' wide outside of the lane stripe. However, if this isn't possible, any additional width of paved shoulder is an improvement. Where funding is limited, adding or improving shoulders on uphill sections will decrease conflicts.

Aside from adequate width, design features that can improve safety and travel conditions for bicycles along bike routes include smooth pavements, adequate sight distances, improved railroad track crossings, bicycle-safe drainage grates, and regular debris removal. Ideally, an

effort should be made to adjust traffic control devices to give greater priority to bicyclists.

**Sidewalks.** Although not considered as 'trails' for the purposes of this plan, sidewalks are a key component of pedestrian transportation. Sidewalks parallel streets and generally are appropriate only for pedestrians. In some instances sidewalks can accommodate bicycles as well.

Pedestrians primarily use sidewalks, as opposed to shared roadways, in more densely developed areas. Their safety needs, including time to cross streets, should be considered at all intersections, and especially at traffic signals. Sidewalks should be maintained and enhancements made wherever possible to the walking environment.

## TRAIL DESIGN AND SITING CONSIDERATIONS

The usability and sustainability of a trail will be closely tied to its design and location. The following topics address some of the design and siting issues that should be considered during the planning process.

**Trailheads.** The following criteria should be followed at trailheads for multi-use pathways:

- Trailheads should be marked with the trail name, any use restrictions, and “Good Neighbor” information. Total mileage and distances to notable sites along the route is appreciated by all users.
- Trailhead parking must adequately handle user need and be sized in reference to amount of use.
- Any trails designated as a non-motorized is not meant to include restrictions on motorized wheelchairs and other mechanical means of transportation by users with disabilities. Trails should be built in compliance with the Americans with Disabilities Act whenever possible.
- Clearly marked signs should forbid travel on shortcuts or route closures to prevent possible environmental damage.

**Trail Corridors.** Trails are to be routed so as to maintain a natural setting, to avoid unnecessary disturbance to private landowners adjacent to the trail and to preserve wildlife habitat and important vegetation. Public lands and rights-of-way should be used whenever possible. While the minimum acceptable trail easement is generally considered 25 feet, the more practical and desirable

easement width is 35 feet, except in riparian areas, where a larger easement may be appropriate.

**Resource Protection.** Maintaining healthy buffers adjacent to streams is an effective and inexpensive way to protect watersheds. Buffers maintain functioning riparian vegetation and floodplains, protect water quality, stabilize stream banks, provide wildlife habitat and open space, and reduce landowner and taxpayer costs to mitigate flood damage.

Any trail near a waterway should be constructed so as not to adversely affect water quality or riparian vegetation or impair the natural processes of the waterway, such as meandering and spring flooding. While it is usually desirable to locate trails in preserved corridors to create greenways, trails should not be routed continuously along stream banks, depriving wildlife of undisturbed habitat. Rather, they generally should be set back from the stream, providing sporadic access points to the water either by the use of spurs or by occasionally routing the main trail to the bank.

Trails can be used to improve degraded habitat by consolidating social trails into one well designed pathway. Trails through natural environments are wonderful places

to enjoy time with dogs, but they must not be permitted to chase, harass or kill wildlife or livestock.

**Road Crossings.** Road crossings should occur at points of good visibility, perpendicular to the roadway and at natural crossings, if possible. Full access sections should be equipped with curb cuts. Signed and striped crosswalks should accompany crossings in most cases. At high-traffic road crossings, tunnels or pedestrian overpasses are preferred to at-grade crossings.

**Signage.** Standard and consistent signs should be used throughout the trail system to designate trailheads, pathway uses, directional information, and educational/historical information. Class I trails should be signed at road crossings and all other public access points with signs that define uses and restrictions. Class II and III trails should be signed only at the main entrances. These signs should describe uses, trail surface conditions, and limitations, such as ADA degree of access.

Please see Appendix I for ASHTO trail standards and specifications.

## LANDOWNER CONSIDERATIONS

Respect for private property rights is essential. Access should not be allowed or provided from a pathway onto private property without the permission of the landowner. On any trail that is constructed along a pre-existing corridor currently used for a different purpose (such as a power line), the pre-existing rights held by adjacent landowners should continue to be honored. Signs should be posted reminding users to “Please respect private property by staying on the trail”. Montana has enacted a law (MCA 70-16-302) to protect landowners who allow the public onto their property free of charge for recreational purposes.

Trails have been shown to reduce crime and increase property values. Well-planned trails attract families, local residents, tourists, and other responsible people whose presence on the trails serves as a neighborhood watch. Access to trails is one of the most desirable amenities that homebuyers seek, and the value of most properties is enhanced by being near a trail.



# CLIMATIC CONSIDERATIONS

When developing a trail system in Ravalli County, the unique climatic conditions should be kept in mind in order to create the most useable and sustainable system possible.

The climate of the Bitterroot Valley is generally considered moderate. In fact, the area is sometimes known as the "Banana Belt" of Montana because of the mild weather for a northern area. While snowfall in the valley is only about 6 inches per year, the Bitterroot and Sapphire mountain areas average about 200 inches of snow per year. Most days are sunny with about 270 such days each year. The average annual rainfall is 12-15 inches per year.

Local climate will be an important practical consideration when developing goals for use of a trail or trail segment. During the project scoping process, members of the public expressed a desire to accommodate both recreational uses and alternative travel uses through trails in Ravalli County. However, the siting and design of a primarily recreational trail versus a transportation-oriented trail will vary.

For example, there will be a better chance of year-round use if a trail leading to or in areas rich in rural and natural attributes is designed to accommodate

- hikers and bikers in the warmer months and
- cross country skiers and snowshoers during times of sufficient snow accumulation.

Most likely, a trail of this type would be gravel or an unimproved, marked path. A trail of this type may not easily accommodate users with mobility limitations; however, maintenance could be less expensive and could be performed by non-professional volunteer groups as a community service project.

On the other hand, if the primary use of a trail or trail segment has been designated as a transportation route between town centers, a paved surface for bike traffic and other non-motorized, wheeled transportation methods might be more appropriate. This would allow for more efficient, rapid, and inclusive travel, but would need to be plowed for use in the winter months. Also, due to the freeze-thaw cycles of northern climates, there would be greater need for professional service and maintenance costs to provide a useable trail throughout the year.

Ideally, a variety of trail options should be provided as part of a comprehensive county-wide trail system.

Planners and decision makers should carefully consider the goals and policies of this document, as well as the most likely use and users of a specific trail or trail segment when siting and designing the facility. Climatic considerations should play an important part in this decision making process.

## TRAIL MAINTENANCE CONSIDERATIONS

Before constructing trails, maintenance responsibilities should be established. Typically, the responsible entity will be the owner of the trail corridor or right-of-way. Private landowners or developers who grant public easement onto their property for trail usage should develop a shared agreement with the County regarding maintenance responsibilities. The County should adopt a formalized process to determine if they are able to take on the responsibilities of maintenance associated with a particular trail segment in order to help guarantee long term viability. It is critical that the funding authority, both for immediate implementation and long term maintenance, be established prior to acquisition of a trail. Appendix J includes many items which might be appropriate to include when considering long term maintenance of a trail.

Volunteers are a common source of manpower for maintenance tasks. Sources that may be utilized include civic organizations, conservation/recreation organizations, and adopt-a-trail programs. Several successful, long term trail maintenance models exist in Ravalli County including the Backcountry Horsemen, the Bitterroot Ridgerunner Snowmobile Club, and the Bitterroot Cross Country Ski Club.

Trails should be monitored frequently for damage and users should be encouraged to contact the managing agency when damaged areas or unsafe conditions arise.

Reference Appendix K for information on weed control, Appendix L for information on controlling weeds and mowing issues with domestic goats, and appendices M and N, for detailed recommendations on trail maintenance.

## ADMINISTRATION CONSIDERATIONS

A comprehensive trails system will most effectively be implemented if some official body is created to administer a directed program of planning, advocacy, fund raising, acquisition, construction, maintenance and monitoring. It is possible that a community-minded, non-governmental organization could administer a trails program, but

ultimately the long-term administration should be housed within local government.

At a minimum, the trails plan should be adopted by Ravalli County, incorporated into the Master Parks and Recreation Plan, and used to inform the County subdivision regulations. Parkland dedication requirements in the subdivision review process could require publicly accessible trail easements, wherever consistent with the Trails Plan. This could be of great benefit in establishing sections of trail throughout the County, though not necessarily for a connected system. In a case such as this, the inclusion of a trail easement, depending on the amount of land eased, should be considered adequate to fulfill the parkland dedication requirements of the subdivision process. In order to increase the appeal of including trails in new developments, developers must know that they will not also be asked for a park land dedication fee or to donate additional parkland.

Off-road pathways are, in essence, linear parks, and from the standpoint of efficiency and statutory authorities, it makes sense to combine the two resources under one administrative body – most likely, the Ravalli County Park Board. Bike routes and bike lanes, as on-road facilities, might best be planned by the trails administrative body, but constructed and maintained by the Ravalli County

Road and Bridge Department, which should be brought into any discussions regarding inclusion of trails along roadways at an early stage.

## WORKING WITH VOLUNTEERS

Volunteers can be a valuable asset to a community trails program. They bring enthusiasm, experience, and new ideas. However, volunteers must be carefully engaged so that they are an asset and will maintain their interest and involvement in the long term.

The first step to involving volunteers in a trails program is to determine how volunteers could best be used. Some ideas for utilizing volunteers for implementation of a trail system include:

- Assisting with trail maintenance and construction;
- Garnering support for a trail system amongst friends and neighbors;
- Assisting with fundraising for the trail system;
- Monitoring trail use and helping to educate users on natural resource protection and private property rights of land owners along trail system.

Be clear and communicate with volunteers exactly what is expected of them and what kind of commitment you are

asking for. Once they are engaged, volunteers must be given tasks that are within their capabilities. Conduct a skills assessment of potential volunteers if necessary to match their interest and experiences with tasks that need to be completed.

Most importantly, celebrate successes with volunteers and make sure they know that their work is useful and appreciated. A volunteer program isn't worth much if there are no volunteers; making volunteers feel good about what they are doing will help ensure they return.

Potential sources to recruit volunteers might be from local youth groups, membership of interested non-profit organizations, or the recreation community. Groups such as the Backcountry Horsemen, the Cross Country Ski Club, and the local Soroptimist Club have a long history of volunteering to service trails in the Bitterroot Valley, although primarily on Forest Service Land. Additionally, the impact of appointed citizen advisory boards, most notable the Ravalli County Park Board, must not be overlooked. Volunteers such as these play an important role in assisting the decision makers in turning visions into reality.

Trails can have a positive influence of a variety of topics including health, economic viability, and recreation opportunities. Engaging citizens on issues that they already care about, with an emphasis on trails as a mechanism to achieve their goals, can be a successful tactic to develop a trails system.

## FUNDING CONSIDERATIONS

Funding for construction, maintenance and management of the trails system can come from a variety of sources. It should be acknowledged that in the past, a comprehensive trail system has not been a funded priority in Ravalli County. Success of a comprehensive trail system will depend both on adequate public support and adequate funding. Appendix O lists many public and private sources of grants for trail development.

Avenues currently available to the County to fund the development and operation of a trail system may include:

**General fund.** County Commissioners can allocate money from the operating budget to the Park Board or Road and Bridge Department to construct or maintain trails. However, budgets are already tight for existing programs.

**Property tax levee.** County commissioners can create a new mill levy to fund parks and trails, and the revenue would go into a dedicated fund that could not be tapped for other purposes. Mill levies can create a long-term funding source for maintenance and operations. New property tax levies must be approved by voters.

**Bond initiative.** City and county commissioners can ask electors to approve a bond for parks and trails, if the ceiling on bonded indebtedness has not yet been reached.



Bonds allow communities to borrow a large sum of money, which they often pay back over time through property taxes. Bond money can be used only to acquire lands and construct projects, not to maintain or manage them.

### **Grants/ Technical Assistance Programs.**

Two common grant funding sources are the Recreational Trails Program and Community Transportation Enhancement Program, both part of the federal highway program administered by the state.

Another program often used by communities interested in implementing a comprehensive trail system is Safe Routes to School. This program provides information and technical information

“designed to decrease traffic and pollution and increase the health of children and the community. The program promotes walking and biking to school through education and incentives that show how much fun it can be. The program also addresses the safety concerns of parents by encouraging greater enforcement of traffic laws, educating the public, and exploring ways to create safer streets.”  
([www.saferoutestoschools.org](http://www.saferoutestoschools.org))

The National Parks System Rivers, Trails, and Conservation Assistance Program “also known as the Rivers & Trails Program or RTCA, is the community assistance arm of the National Park Service. RTCA staff provide technical assistance to communities so they can conserve rivers, preserve open space, and develop trails and greenways.” ([www.ncrc.nps.gov/rtca](http://www.ncrc.nps.gov/rtca))

Any outside support sought and accepted by Ravalli County should be carefully considered within the context of the comprehensive trails program. Even if all construction costs could be covered by grants, consistent funding still will be needed for maintenance and management. These funds may need to be provided through local government.

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## **Appendix A: Missoula trail system case study, from the State of Montana Trails Plan**

### **Missoula's Trail System: A Case Study of a Trails Success Story**

Missoula's trail system spans a broad range of landscapes and offers myriad opportunities for outdoor recreation and alternative transportation, accessing city parks, open space along the Clark Fork Riverfront, and connecting to the Lolo National Forest.

The Missoula Trails Project began in 1990 and eventually spawned the *Feet First Non-Motorized Transportation Program*. The program is guided by the Missoula Non-Motorized Transportation Steering Committee, which meets monthly with the Project Manager. This group represents the public interest, and is made up of a representative from the sponsoring agencies, along with staff from City and County departments such as Engineering, Transportation and Land-Use Planning. Sponsors of the Feet First Program include the City of Missoula, the Missoula Redevelopment Agency, and the University of Montana (Missoula), with support from FWP's Region 2 staff and the Lolo National Forest. An Oversight Committee comprised of the mayor and agency heads meets several times a year for updates and direction setting.

The program focuses on implementing the Non-Motorized Plan, securing funding, acquiring rights-of-way, and constructing trails with volunteers and/or contract labor and services. Also, the Committee reviews developments and subdivisions for impacts on trail planning, and encourages development of trail segments as part of the infrastructure of all developments. The City is in the process of adopting a system of trails standards, as well, to address different levels of development and the standards for each level, based on the amount and types of use. Beyond the City limits, the County Surveyor has established standards for projects the County supervises. The ultimate goal is the realization of an area-wide non-motorized circulation system. Additionally, the community would like to improve disabled access.

Trail-related land use conflicts are being addressed via land stewardship and management programs, which are being developed by the Planning Department and other interested parties, particularly the Open Space Advisory Committee. Existing ordinances will be adapted to address the level of trail access needed for various user groups, as well as to protect sensitive resources. Educational efforts are a key component of trail-related resource protection.

Public involvement has been integral to the success of the program. Project proposals are first submitted by interested groups and individuals, then rated by the Steering Committee using a variety of criteria. Each project is coordinated by the Feet First program, and is a cooperative effort between local government agencies and various private partners. The public is involved in each stage of the process, from conceptualization to project completion.

The City passed an Open Space Bond in 1995. The funds were intended to help finance the planned Bicycle Commuter Network, in addition to the purchase of hundreds of acres on Mt. Jumbo, a landmark resource area near downtown (this has been accomplished). The Bicycle Commuter Network is intended to connect Missoula's major east-west and north-south arterials.

Mount Jumbo's major resource value is open space and habitat preservation, but there are many opportunities for hiking (especially informal hiking opportunities).

The Missoula Parks and Recreation Department incorporates trail maintenance into its regular activities, including winter snow removal on trails and sidewalks. Street Department personnel and equipment are sometimes enlisted for trails-related work beyond the scope of the Parks and Recreation Department's ability. The City also instituted an Adopt-a-Trail Program in the fall of 1996. Several local groups already maintain local trails on an informal basis under the direction of the Parks and Recreation Department. Law enforcement is handled by the City and County police departments. Transient camps along remote areas of some trails are the worst problem.

Another group involved with the City's trail system is the Missoula Neighborhood Network, which is an affiliation of neighborhood councils. This group and similar groups in the county maintain close communication with the Feet First Program regarding their interests and goals. Additionally, the Montana Conservation Corps has been a vital partner, providing both paid and volunteer labor for trail construction, maintenance, tree planting, and coordinating student work groups in the classroom and at trail sites. Returned Peace Corps volunteers and folks from the Retired Senior Volunteer Program (RSVP) also play important roles, as do schools and private corporations.

A diversity of funding sources are used for the Missoula trail system, including donations of labor and materials, corporate sponsorships, lease fees for private use of public land, the fuel tax, state administered grant programs, Missoula Redevelopment Agency tax increment funds, and a small trails fund established by a local donor.

*(Note: Special thanks to Mary Jean Gillman with Missoula's Feet First for help putting this profile together.)*

## Appendix B: Case study, Billings Montana

### Safe Routes to School

#### SRTS CASE STUDY: Billings, Montana Go Play in Billings, Montana



#### Introduction

"Go Play" has new meaning in Billings, Montana. In 2004, the city with a population of 100,000 and with 23 elementary schools had been designated the least safe city for pedestrians in Montana by the Mean Streets Surface Transportation Policy Project.

In September 2008, Billings received bronze level status as a bicycle-friendly city from the American League of Bicyclists, thanks to its "Go Play" community awareness campaign to encourage children and their families to walk and bicycle safely to schools.

Community health advocate and parent Kathy Aragon said that Billings is fortunate because many students live close enough to walk and bicycle to school, and some neighborhoods have nearby bike paths and trails that provide direct routes to school without crossing major roadways. The "Go Play Billings Trails" program seeks to build upon that strength.

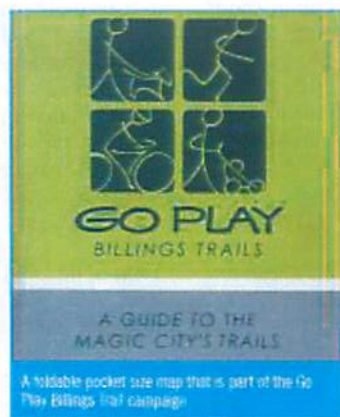
"It's all about community awareness," Aragon said. "We have an enormous amount of collaboration."

Before all the pieces of the program came together, the Yellowstone City-County Health Department surveyed all the elementary schools using the SRTS Parent and Caregiver Survey on Walking and Bicycling to measure attitudes and barriers affecting walking and bicycling to school. Results indicated 804 of the 2,633 respondents walked or bicycled to school, approximately 31 percent. Surveyed parents reported concerns about motorist behavior and awareness of children walking and bicycling to school. With enhanced community education, Aragon expects the number of students walking and bicycling to school to increase, and along with it, community knowledge about safety and opportunities for walking and bicycling.

#### Activities

The "Go Play Billings Trails" program is a non-infrastructure program that began when St. Vincent Healthcare donated \$5,000 in 2006, which enabled students from Montana State University-Billings to develop a brochure of information to encourage safe walking and bicycling in Billings. Sarah Keller, assistant professor in the Communication and Theater Department at MSU-B, co-directed the effort with Aragon, who is Health and Safety Chairperson for the Highland Elementary School PTA. The "Go Play Billings Trails" campaign delineates trails and bike paths throughout the city and highlights economic, safety and health aspects of walking and bicycling.

In March 2007, Aragon and Yellowstone County received a \$10,000 SRTS grant from the Montana Department of Transportation (MDT) to fund events, as well as billboards that are located near schools. Billings held the 6-mile-long Magic City Trail Trek, in late spring 2007, and in the fall Aragon organized Saturday Live Fun Run/Walk, which is a two-mile long School District fundraiser. At each event, volunteers distributed information about safe walking and bicycling to



#### Go Play in Billings, Montana

children and parents.

This non-infrastructure program complements a \$25,000 SRTS infrastructure grant that Billings received from the MDT's state SRTS program in 2007 for the Chandelier Crossing for children going to Arrowhead Elementary School. The crossing was built as part of the Big Ditch Trail, Phase 2, according to Darlene Tussing, Alternate Modes Coordinator for the City-County Planning Office. The sidewalk connected a residential area to a bike trail, which provided direct access to Arrowhead Elementary for students.

Many of Billings' community leaders and organizations share a desire to promote healthy, safe alternatives to vehicles when possible. For example, Billings Public Schools created a School Health Advisory Committee that has included SRTS programs in its physical activity recommendations for Billings public schools. Yellowstone City-County Health Department is working on a "Healthy Places" initiative and partnering with two hospitals and the city to promote the Trail Trek event in cooperation with MSU-B. In addition, the trail advocacy organization BikeNet ([www.bikenet.org](http://www.bikenet.org)) is a partner in the Trail Trek event and a community supporter of "Go Play." Aragon is a member of Billings Action for Healthy Kids, a group with a longstanding commitment to helping Billings improve health through nutrition and fitness. Team members include a variety of health and education advocates. Two of the members write weekly columns for the local newspaper. They help promote International Walk to School Day in the fall, and they promote bicycling and walking safety through their own programs, such as Big Sky State Games, which has a three-month fitness program in which many school staff and students participate.

The Billings Clinic donated \$200 to help with the Trail Trek, and for years, area physicians have donated money to provide helmets for school-based helmet programs. The Think First program is a joint hospital collaborative that provides low cost helmets at both the Trail Trek and Saturday Live Fun Run. The Highland Elementary School librarian held a two-month long unit on bicycle safety, complete with "celebrities" such as the mayor and a bicycle-riding law enforcement officer reading bicycle-related books. Aragon makes sure that SRTS information is available at the spring Child Safety Fair, YMCA's Healthy Kids Day and various PTA gatherings including the statewide PTA gathering that was held in Billings in fall 2007.

#### Milestones

Aragon estimated that in the first year, 300 participants enjoyed the Trail Trek and approximately 200 people participated in the fall Fun Run/Walk. Volunteers from Highland Elementary as well as local running, bicycling and trail groups work to make the events operate smoothly.

The two annual "Go Play" events doubled participation in two years, and during International Walk to School week, one class at Highland Elementary School reported a walk/bike rate of 84 percent. Twenty-three percent of children in Yellowstone County walk or bicycle to school. International Walk to School was celebrated by 100 percent of neighborhood schools in the city core.

Future planned projects include a \$25,000 SRTS infrastructure grant from MDT that will make the sidewalks

"It's all about community awareness. We have an enormous amount of collaboration."

Kathy Aragon, Health and Safety Chairperson, Highland Elementary School PTA





## Go Play in Billings, Montana

at Highland Elementary contiguous, connecting a rear pedestrian-only entrance to the school. In addition, a \$49,495 grant from MDOT was awarded to McKinley Elementary for "bulb outs" and other safety improvements at intersections. Aragon also plans to seek funds that will provide mini-grants to enable all 23 elementary schools in Billings to hold International Walk to School Day events. Additionally, the city of Billings has applied for a SRTS grant to create a district-wide safety plan.

Aragon believes that by educating students, parents and other community members and increasing their participation in walking and bicycling, they will be more aware of pedestrians and bicyclists, and that awareness will increase safety for everyone.

### Contact

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Health and Safety Chairperson  
Highland Elementary School PTA  
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jcnaragon@bresnan.net




For more resources and information on Safe Routes to School, please visit the National Center for Safe Routes to School Web site at [www.saferoutesinfo.org](http://www.saferoutesinfo.org).

## Appendix C: Case Study, Countywide Trail Implementation in Washington State

### National Park Service

National Park Service  
U.S. Department of the Interior



### Partnerships



#### COUNTYWIDE TRAIL IMPLEMENTATION PROJECT

**Description:** In October, 2002, a trail implementation project was initiated in Pierce County, Washington, to develop a strategy for building an interconnected countywide trail system in a timely and efficient manner.

The project was initiated by ForeverGreen, a non-profit 'System of Parks' collaborative established in 2000 to partner in the delivery of park and recreation programs and resources to the citizens of Pierce County through a coordinated system of park, open space, and recreation service providers. The ForeverGreen Board of Directors includes elected officials, business leaders, non-profit organizations, and recreation directors from city, county, state and federal agencies in Pierce County, including Mount Rainier National Park.

An issue that repeatedly surfaced at ForeverGreen board meetings was the need to develop a system of interconnected, non-motorized trails, throughout Pierce County. Public demand for such a system was high and people were frustrated at the slow pace and limited extent of trail construction.

To address this issue, ForeverGreen submitted an application for planning assistance to the Rivers, Trails, and Conservation Assistance (RTCA) program of the National Park Service. The application requested RTCA assistance in developing a coordinated implementation strategy to get a trail system built based on existing trail plans (not new trail planning). The grant request was approved and a collaborative project began in October 2002 with three objectives:

1. Inventory and map what already exists in adopted trail plans
2. Analyze/assess why the trail system is not getting built in a timely manner
3. Develop an implementation strategy to build a countywide trail system

The inventory and mapping of existing trail plans was completed by the summer of 2003. For the purpose of the project, the map was prepared at a 'macro' scale to illustrate primary routes only. This process illustrated a clear picture of the potential for a countywide trail system as envisioned in existing trail planning documents.

The next phase of the project was to analyze and assess why the trail

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system (as envisioned in existing trail plans) was not getting built in a timely manner. After many meetings, interviews, discussions, and debates, the planning team assembled the following conclusions:

- There was no one central 'lead' organization recognized in Pierce County with inter-jurisdictional authority to develop trails
- The business of building trails across jurisdictional boundaries is complex and requires an enormous amount of staff time, resources, and specialized expertise
- Park and recreation departments, in particular, aren't typically organized for this type of work
- Building trails requires specialized knowledge and professional expertise in fields such as:
  - Right-of-way acquisition
  - Planning
  - Grant writing and management
  - Design and engineering
  - Permitting
  - Construction

In the last phase, the Planning Team developed a proposal for ForeverGreen to partner with the Pierce Conservation District (a member of the ForeverGreen Board) to form a new 'Trails Technical Assistance' office with the ability to work inter-jurisdictionally throughout Pierce County. The office would be a stand-alone operation, dedicated exclusively to trail development, and would provide technical assistance in areas related to right-of-way acquisition, design, engineering, permitting, planning, and grant writing. The ForeverGreen Board would continue to be responsible for trail development by providing policy, direction, and priorities to the Trails Technical Assistance office. Funding for the office would come from future conservation assessment collections starting in July, 2007.

The ForeverGreen Board accepted and endorsed the proposal in late winter, 2004. Efforts between then and July, 2007, are concentrated on extensive public and stakeholder outreach to explain the proposal and develop a constituency of support.

**Geographic area covered:** Pierce County, in western Washington State, is located in the south Puget Sound region. Bounded on the north by Seattle and King County, and to the south by Olympia and Thurston County, Pierce County encompasses part of Mount Rainier National Park to the east, the City of Tacoma to the west, and includes a total of 22 incorporated towns and cities.

#### List of partners and relationships:

- Terry Lee, Pierce County Council representative and Chair, ForeverGreen Council
- Dave Uberuaga, Superintendent, Mount Rainier National Park
- Jan Wolcott, Director, Pierce County Department of Parks and Recreation
- Jack Wilson, Director, Metropolitan Park District of Tacoma
- Monty Mahan, Director, Pierce Conservation District
- Ernie Bay, Foothills Rails-to-Trails Coalition and Board Member,

**Pierce Conservation District**

- Barbara Skinner, Mayor, City of Sumner
- John Olson, Coldwell Banker, Board Member Foothills Rails-to-Trails Conservancy, Cascade Land Conservancy
- Bob Carlson, Manager of The Puyallup Fair (recently retired)
- Brad Cheney, The Ben B. Cheney Foundation
- Vince Hardy, Morgan Stanley
- Debbie Repala, Washington State Senator, 27th District
- Tom Stenger, Tacoma City Council
- El Vandeberg, Attorney-at-Law, Vandeberg Johnson Gandara
- Kirk Kirkland, Tahoma Audubon
- Peter Stanley, Tide's Tavern
- Judith Nilan, Stone McLaren
- Judith Lorbeir, Environmental Coordinator, City of Tacoma (recently retired)

**Accomplishments to date:**

An extensive planning project was completed that accomplished the following:

- Review and inventory of existing trail plans
- Preparation of a map graphic illustrating potential for developing a countywide trail system
- Analysis of the problem (i.e., why isn't the trail system getting built in a timely and efficient manner?)
- Development of an implementation strategy
- Concurrence from the Pierce Conservation District Board of Directors to establish and fund a "Trails Technical Assistance" office
- Adoption of the proposal by the ForeverGreen Council
- Development of a brochure explaining the strategy (pending)
- Development of a powerpoint presentation explaining the strategy (pending)
- Development of a press release and coordination of significant media exposure (pending)
- Plan for significant outreach to governments, groups and organizations (e.g., city councils, park boards, youth groups, bicycle clubs, health and physical activity coalitions, etc).

**Key success factors:**

- The right project
- Commitment of staff and resources to work on the project
- Opportunity to capitalize on previous trail planning efforts contained in plans that have been adopted by responsible governments
- Public demand
- Pierce Conservation District Board of Directors willing to establish and fund the "Trails Technical Assistance" office
- Funding to establish the "Trails Technical Assistance" office is not dependent on future grants or new taxes

**Frustrations:**

- Funding for "Trails Technical Assistance" office not available until July, 2007

**Most important lessons learned to date:**

1. It's easier for a park department to acquire and develop a parcel of land into a traditional "park" than it is to plan and develop an inter-jurisdictional trail corridor.
2. Planning and developing a linear trail corridor requires expertise and skill in real estate, title research, right-of-way acquisition and negotiations, community planning, engineering, environmental review, permitting, and grant writing.
3. Trail planning and development requires dedicated staff time, resources and specialized expertise. Planners in small towns and communities are overwhelmed with other responsibilities. Park departments in larger urban areas run multiple programs and facilities and can only dedicate a portion of available resources to trail projects.
4. Lawsuits and legal challenges could be filed by adjacent landowners (of which there can be hundreds). Planning requires extraordinary outreach and coordination with stakeholder groups.
5. Permitting can cost nearly as much as construction and can take years to accomplish due to issues around avoiding or mitigating impacts to natural and cultural resources.

**Prepared by: Bryan Bowden Date posted: 11/28/05**

## **Appendix D. Trail Effects on Neighborhoods: Home Value, Safety, Quality of Life**

*Are trails safe? How do they affect property values of adjacent residents?*

**Compiled by Suzanne Webel, Boulder Area Trails Coalition**

Are trails safe? How do they affect property values of adjacent residents? These perennial issues have been the subject of a few studies which find that trails are quite benign in their social impact. The facts haven't stopped groups organized against rail trail development from trumpeting that the few instances of crime are proof that trails are unsafe.

Homeowners nationwide express the same concerns and fears about proposed trails in their neighborhoods. But studies in various parts of the United States seem to show that concerns about trails lowering property values and increasing crime are unfounded. In fact, trails have consistently been shown to increase (or have no effect on) property values, to have no measurable effect on public safety, and to have an overwhelming positive influence on the quality of life for trail neighbors as well as the larger community.

**1. The Effect of Greenways on Property Values and Public Safety;** The Conservation Fund and Colorado State Parks, State Trails Program (1995)

"The study of Property Values and Public Safety was to determine what effect, if any, the presence of urban trails has had on public safety to property owners who live adjacent to a trail and on property owners who live within one block of a trail. The study also evaluated the level of public acceptance for urban trails and their effect on the quality of life in these neighborhoods...

"The need for the study arose due to concerns expressed by several different neighborhoods over the proposed construction of new trails. These concerns included fears that the presence of an urban trail might lower property values and also create a risk to public safety, thus adversely affecting the quality of life in the neighborhood. These concerns are similar to concerns voiced in the past over proposed trails that are now established and accepted...."

Three Denver trails were studied in detail: "Data was collected in the summer of 1994 by telephone interviews of residents adjacent to or near to the trails, real estate agents who buy and sell homes in metro-Denver, patrol officers who work the trails, and biweekly surveys of the Denver Post Real Estate advertisements...."

Results of the survey show that "urban trails are regarded as an amenity that helps to attract buyers and to sell property. For residents of single family homes adjacent to a trail:

- 29% believed that the existence of the trail would increase the selling price of their home (and 43% said it would have no effect).

- 57% of the residents felt that the trail would make the home easier to sell (with 36% saying no effect).
- 57% of these residents had lived in their homes prior to construction of the trail
- 29% of those surveyed were positively influenced by the trail in their decision to buy the home.
- Results were similarly positive for residents who lived near but not adjacent to the trail..."
- "Of the real estate agents interviewed:
- 73% believed that a home adjacent to a trail would be easier to sell
- 55% agreed that the home would sell for more than a comparable home from a different neighborhood
- 82% of real estate agents used the trail as a selling point
- 100% believed trails are an amenity to the community around it...

"No public safety issues could be directly linked to the trail. Only one resident interviewed was concerned with this issue, and none of the officers interviewed believed trails had any effect on public safety....

"[In summary,] concerns that urban trails might adversely affect [sic] public safety and property value in surrounding neighborhoods are not substantiated by the results of this study. The effect of a trail is beneficial, rather than detrimental."

## **2. The Impact of the Brush Creek Trail on Property Values and Crime; Santa Rosa, CA, Michelle Miller Murphy, Sonoma State University, (1992)**

"The purpose of this study was to determine what effect, if any, a bicycle/pedestrian trail has on property values and crime rates. Concerns by local property owners that proposed trails may negatively affect property values or increase crime prompted this survey. Due to its 9 year existence, the Brush Creek Trail, built along Brush Creek in Santa Rosa's Rincon Valley, was selected as the focus of this survey....

"Seventy five residents were surveyed on how long they had lived in the neighborhood, how the trail has affected their overall quality of life; what effect the trail would have on selling their homes, what effect the trail had in their decision to buy their homes; how the trail has affected their privacy, and what problems, if any, they have had with crime caused by trail users. Additionally, interviews were conducted with apartment and mobile home park managers near the trail, real estate agents with listings adjacent to trails, and law enforcement agencies; fifteen other cities were contacted for information on surveys regarding the effect of trails on property values and crime..."

- 64% of respondents felt the trail increased the quality of life in the neighborhood, with another 13% saying "no effect"
- 33% said the trail would make their home easier to sell, with 49% saying "no effect"



- 23% said the trail would make their home sell for more, with 69% saying "no effect"

Of real estate agents:

- 19% said homes next to a public trail would sell for slightly more, with another 48% saying "no effect"
- 61% of real estate agents said they use proximity to trails as selling points

"The law enforcement agencies had no data to determine crime statistics; survey results from 15 other cities showed only a small number of minor infractions including illegal motorized use of the trail, litter, and unleashed pets.

"The study shows neither increased crime nor decreased property values due to trails. On the contrary, the most overwhelming opinion by residents along the Brush Creek Trail is that the trail/creek has a positive effect on the quality of life in the neighborhood."

**3. Economic Impacts of Protecting Rivers, Trails, and Greenway Corridors: a Resource Book** (1990), Rivers and Trails Conservation Assistance, National Park Service;

This comprehensive volume includes studies from across the U.S., analyzed by impacts on Real Property Values, Expenditures by Residents (i.e. how people spend their leisure dollars), Commercial Uses, Agency Expenditures,

Tourism, Corporate Relocation, Public Cost Reduction, Benefit Estimation, etc.

"The effect on property values of a location near a park or open space has been the subject of several studies... Many studies have revealed increases in property values in instances where the property is located near or adjacent to open spaces..."

A 1978 study of property values in Boulder, Colorado, noted that housing prices declined an average of \$4.20 for each foot of distance from a greenbelt up to 3,200 feet. In one neighborhood, this figure was \$10.20 for each foot of distance. The same study determined that, other variables being equal, the average value of property adjacent to the greenbelt would be 32% higher than those 3,200 feet away.

The same study revealed that "the aggregate property value for one Boulder neighborhood was approximately \$5.4 million greater than if there had been no greenbelt. This results in approximately \$500,000 additional property tax revenue annually. The purchase price of the greenbelt was approximately \$1.5 million. Thus, the potential increase in property tax alone could recover the initial costs in only three years."

A different 1988 Boulder study found that "the public cost for maintaining non-open space, such as developed acres, was estimated to be over \$2,500 per acre, and could be as high as \$3,200 per acre when utilities, flood control, transportation, and subsidiary governmental entities' costs are included. The cost for maintaining open

space in the City was only \$75 per acre, or less than three percent of the cost on non-open space..."

**4. Effects of Three Cary Greenways on Adjacent Residents** (1995), Lauren A. Tedder, University of North Carolina at Chapel Hill

"The purpose of this study was to determine if such problems plague the adjacent and nearby residents of three Cary, North Carolina greenways... a survey of those living near the three greenways was conducted. Respondents were asked questions designed to reveal their satisfaction with the greenway, their initial feelings toward the greenway, the frequency of problems they experienced, their use of the greenway, and their perceptions of the effect of the greenway on their property value.

"The results of the survey, which achieved a 75% response rate, supported the hypothesis that most residents feel satisfied with the greenways and that problems are minimal.

"Planners should take care to instill positive feelings among affected residents toward a proposed greenway by involving them in the planning process, educating them on the benefits of greenways, presenting data that refute their fears of perceived problems, and calming their greatest fears of crime through crime prevention efforts. Reducing the number of occurrences of the most commonly reported problems will require adapting greenways to specific circumstances. For example, noise and loss of privacy problems may be ameliorated by

increased buffers between the greenway and home, while open wood rail fences may more clearly signify property lines and reduce trespassing."

## Appendix E: The Economic and Social Benefit of Trails

### Economic Impacts of Trails

Hosted by [AmericanTrails.org](http://AmericanTrails.org)

#### The Economic and Social Benefit of Trails

*Trails are an important part of community well-being in many areas.*

By Gary Sjoquist  
Quality Bicycle Products



During warm weather months in Minnesota, nearly 1.5 million cyclists, inline skaters, and walkers use our nationally-recognized city, county, and state trails. In fact, these trails are a quality of life issue for residents, as well as luring tourists from neighboring states who don't have access to the number and variety of trails we have in Minnesota. Other than a quality of life issue, our trails are an economic boon to the state as well.

**"Generally, it's been found a trail can bring at least one million dollars annually to a community."**

Lanesboro, on the Root River Trail in Southeastern Minnesota, is an often-cited example of the economic impact a trail can have. Pre- and post-trail Lanesboro, a town of about 800 residents, differ dramatically. Post-trail Lanesboro boasts 12 B&Bs (with year-long waiting lists), 8 restaurants, an art gallery, a museum, and a thriving community theater well-off enough to offer housing to its actors. Economically speaking, the Root River Trail has been very, very good for Lanesboro.

A specific example from Lanesboro can provide further insight. The bike shop in Lanesboro, a small "mom and pop" kind of a place, sold 60 tandem bicycles in a single year (more than the Twin Cities largest multi-store bike retailer that same year). Now, few people would go to Lanesboro to specifically purchase a not-inexpensive tandem bicycle. Rather, this is an indication of people who are having a good time, want it to continue, and are willing to spend the money to spend quality time on the trail. This kind of "impulse" purchase bodes well for retailers along our trails.

Nationally, trail-related expenditures range from less than \$1 per day to more than \$75 per day, depending on mileage covered. Generally, it's been found a trail can bring at least one million dollars annually to a community, depending on how well the town embraces the trail. For a town like Lanesboro, a trail can mean an annual economic impact of more than five million dollars.

Another aspect has to do with how trails affect property values and the general attractiveness of an area. Studies have shown that 70% of landowners felt that overall, an adjacent trail was a good "neighbor," with positive impacts including 1) getting in touch with nature (64%), 2) recreational opportunity (53%), and 3) health benefits (24%).

Furthermore, 70% of real estate agents use trails as a selling feature when selling homes near trails. 80-95% of them feel the trail would make it easier to sell. In Minnesota, 87% of home owners believe trails either increased the value of their homes or had no impact. On Seattle's most popular trail, homeowners with properties near, but not adjacent to the trail, sold for an average of 6% more than comparable property elsewhere. Additionally, the U.S. National Parks Service notes that increases in property values range from 5 to 32% when adjacent to trails and greenways.

To better estimate potential economic impact, it's important to understand a demographic profile. Overall, trail users average about 48 years of age, are more likely to be male, have completed college, with annual household incomes between \$35,000 and \$75,000. In Minnesota, trail users have median incomes \$10,000 higher than average; good news for the communities along the

trail.

With trail users relatively affluent, middle, and interested in spending quality time with families, trails provide a perfect "getaway" adventure. Having access to trails has changed how families recreate, with people taking shorter but more frequent "vacations" closer to home and with a more family-oriented focus.

Trails have also allowed these escapes to include a wider variety of family members. Thanks to our mostly paved trails, and the advent of bicycle trailers, "trail-a-bikes," and comfort bikes, it's not uncommon to see an entire extended family—children, teens, parents, and grandparents—enjoying an outdoor recreational activity. While not an "economic" benefit, necessarily, this is still an important "value added" component trails bring to our state.

For more information, contact the Parks & Trails Council of Minnesota at: 651-721-1100 (toll-free) or 651-721-1101 (local) (outside Minnesota) 275 C. 4th Street #642, St. Paul MN 55101-1631 -- e-mail: [info@parksandtrails.org](mailto:info@parksandtrails.org)

Other links:

[MN Dept. of Natural Resources home page](#)

[Metropolitan Council Regional Parks](#)

February 2003

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Updated August 17, 2008

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## Appendix F: What's a trail really worth?

### Economic Impacts of Trails

#### What's a trail really worth?

*Economic impact extends not only to the actual trail user but to businesses that derive an income from users of the trail.*

By Bonnie Davis

From *Spring 1997 Trail Tracks*, the national newsletter of *American Trails*

**"Trail users must present economic impact figures on just how much money a trail generates."**

To advocate preserving, developing, or expanding equine use on trails, horsemen have always cited rights, tradition, and recreation. That used to work if horsemen formed a united front, but with more users demanding wider use, we need to include other trail values so we can maintain a hoof-hold on trails.

Today the bureaucratic trail planning system usually includes the buzzwords "financial cost" and "economic impact." Trail

users must present economic impact figures on just how much money a trail generates.

Economic impact is the dollars and cents generated because of a trail. These are monies spent by trail users for trail riding-- dollars that are generated or circulated because of the trail.

How does a group find economic impact figures? How does a group go about "dollar and centing" it? Who do you talk to?

The answers are, right in your own barn... on your own trails... among your own riding companions... with your own economic impact generated by your horse.

The majority of horses owned in this country are pleasure horses that are used for riding on trails. Unlike bikers and hikers who can go home, take off their hiking boots or park their bikes, a pleasure trail horse can't be parked and forgotten. A horse has to be fed, maintained, and housed. So the biggest economic impact of an equestrian trail system is the cost of maintaining the animal used on the trail system-- the horse.

Where is your horse boarded? Do you board in a barn or stable that is on or close to a trail system or park? If those trails were closed to you, would you stay in that same barn or move to another that is on a trail system open to horses? What do you pay in board bills to have your horse close to that trail system? That figure is a significant economic impact.

At the Ed Levin County Park in Santa Clara County (Calif.), 24 miles of multi-use trails were fenced. Horsemen who had ridden in the park for the previous 24 years were reduced to an 8 a.m. opening and a dusk closing. In fact, gates were often closed at 2 and 3 in the afternoon

and not unlocked for a day or two.

After months of complaints, a meeting was held with park staff, county park directors, and trail users-- including individuals who boarded horses around the park and those who trailered horses into the park. More than 100 horsemen attended, bringing with them some economic impact figures: nine stables near the park house more than 1,200 horses used primarily in the park for trail riding. Board bills range from \$125 up to \$250 per horse per month.

As one stable owner stated, "My place has 150 horses. More than 135 of them are ridden in the park on the trails as pleasure trail animals. I took a couple of days and asked each of my boarders why they're at my place and where they ride. Most said they rode in the park and are at my place because I've got easy access into the park for trail riding.

"If these trails are closed or unreasonably restricted, I'm going to lose easily 95 to 125 boarders because these people are going to move someplace else so they can have a trail to ride on. I can't have that kind of loss and stay in business, so when those restrictions go up and those gates stay locked, remember park staff is affecting not only my business but the monies I put into the county."

Using this stable's economic impact, average board bill is \$205 per horse per month. With more than 125 boarders stabling directly because of the park and trails, a dollars and cents figure of \$307,500 is generated each year as a direct result of the park and its trails. And this figure is conservative because other boarders also use the park and trails but don't consider it the primary reason for boarding at this stable.

Projecting my own economic impact statement, I stable two horses at another barn on the edge of Levin Park. I board there specifically because it's close to trails-- across the pasture and I'm in the park, on a trail, and can ride for up to 100 miles. To keep my two horses in this stable, I pay \$370 a month. For 1993 alone, my economic impact to Santa Clara County via the stable was \$4,440. Add the other 112 horses in this barn to my figures and the total for this barn is \$253,080 yearly. Add the other eight barns and a conservative economic impact for boarding horses around Ed Levin Park for trail riding is several million dollars a year.

Vet and shoeing bills add another million dollars per year. Feed and tack stores also profit from the horse owners around the park. Plus there were figures on horses trailered in; all had to pay park entrance fees of \$3 to ride the trails. So these estimates were totaled at \$5 million per year and presented to park staff on what the trails of Ed Levin Park are really worth to Santa Clara County.

The outcome of the meeting was received in a letter from the director of the Santa Clara County Parks and Recreation Department. It stated: "It was decided that gates in Ed Levin Park would be closed between the hours of dusk and dawn by park personnel, but will not be locked."

This was just one trail system in one park. The horseman on a trail is a visible aspect of trail use, but the economic impact of that horseman is just beginning to be realized.

Horse trailer license fees should also be accounted for. Simply count the number of trailers in the area, call the department of motor vehicles for an estimate of license fees, and multiply by the number of trailers to get a yearly economic impact. A portion of license fees goes to the county or city, and part to the state. So when one horse owner sells a trailer because of lack of trails to haul to in a reasonable distance, not only do the city and county lose revenue, the state loses also.

On top of trailer fees, add the cost of fuel for the towing vehicle. And don't forget those other dollars spent by horse owners when returning from a trail ride-- dinner at a local restaurant, groceries bought at the local grocery store, and so on.

In some areas, commercial packers, dude ranches, or rental stables also use trails. They pay a business license, a percentage fee, and insurance premiums to the park or trail system. They hire individuals to lead groups and maintain the property, so employment is also an economic impact. If the trail was closed, how much money would a park or county lose because of the closure of that business?

What is the economic impact on tourist trade in the area? How much is spent in air fares getting there? In motels, restaurants? At local stores for clothing and gear? All are directly related economic impacts because of a specific horse-related service in a specific area using a specific trail.

Some businesses close to trails cater to trail users, and their very existence can be directly related to trail users. For example, a small deli-restaurant in Fremont, California, located on the Alameda Creek Trail has placed hitch posts in a small grove of trees off to one side of the establishment. On a Sunday, all 18 hitch posts have horses tied to them as riders sit at picnic tables in the trees enjoying lunch.

According to the owner, Al Wilson, "I'd say 25% of my weekend business comes from the horsemen on this trail. I also get a lot of hikers and bikers from the other trail, but I'd never have thought a trail could help me out with business like this has. It was sort of an afterthought when we opened, and business on weekends was slow. If I lose this trail business I would definitely feel an impact. I'd probably lay off one or two of my weekend help."

So economic impact extends not only to the actual trail user but to support businesses that derive an income from the individuals who use the trail.

In addition an economic impact can be generated for the agency owning the trail. The sales of T-shirts, jackets, books, patches, and maps, plus parking fees and trail permit fees, are all monies derived for an agency because of the trail. If the trail wasn't there, there would be no sales.

All of the volunteer hours spent developing and maintaining trails are economic impacts, too. Those hours and the cost of hauling volunteer personnel, equipment, and volunteered stock in to do the work are economic impacts and should be calculated and documented. Volunteer economic impacts are generated dollars to keep and maintain trails with little financial cost to the agency.

As more and more users begin to venture out on the trails, there is going to be more demand for trail space. As agencies feel budget cuts and less tax monies flow in, trails are going to suffer.

Trail users who want to maintain their particular trail use or expand their trail systems must look beyond the tradition, the right, and the recreation aspects of trails. Trail users with the best economic impact statistics to offset financial costs are the ones who are going to hold on to critical trail space.

Facts and figures documenting what a trail is really worth can help the equine community be among the next century's trail users.



## Appendix G: Trails add value to new homes

### Benefits of Trails and Greenways

Hosted by [AmericanTrails.org](http://AmericanTrails.org)

#### Trails add value to new homes

What community amenity gives the developer/builder the highest return on the investment in new homes for the real estate market?

By Randy Martin  
[Trailscape.net](http://Trailscape.net)

IN THE LAST FEW YEARS, it has become clear that natural surface trails are the lowest-cost amenity for a developer to build and maintain. More importantly, however, is that in surveys across the nation, trails are the most popular amenity preferred by home buyers and usually consume very little residual (buildable) land.

Given those advantages, it is surprising how little serious consideration has been given to such a high-yielding amenity. In this challenging market, we believe it is time that trails are given the respect they deserve.

With the help of Merit Property Management and The Planning Center, we have compiled a

list of amenities with estimates of cost, and cost per unit for construction and maintenance. We have also indicated the results of an American Lives survey of the popularity of various amenities. Of course, the actual costs will adjust depending on limitless variables, but what is most important is the comparison of one amenity to another, in both the cost category as well as desirability.



A recent survey shows that 79% of home buyers want walking and biking paths.

#### Amenity Estimate (800 UNIT DEVELOPMENT SPRINGVILLE, CALIFORNIA)

AMENITY	SIZE	COST/UNIT	MAINTENANCE/UNIT / MONTH	2005 % DESIRED
Natural Surface Trails	8 miles	\$500	\$1	80%
Paved Trails	8 miles	\$625	\$4	80%
Ball Fields	2 acres	\$1,125	\$8	50%
Pool & Facilities	1 acre	\$1,750	\$21	45%
Four Parks	0.75 acre each	\$3,750	\$6	60%
Golf Course	18 Holes	\$11,250	\$52	20%

What is astounding is that for an initial cost well under \$1,000 per unit and a maintenance cost of less than \$1 per month per unit, a project can have the amenity that 80 percent of buyers want—natural surface trails.

Based on only a three percent increase in value to the homes by the addition of the most popular amenity, a \$520,000 investment would yield \$7,200,000 in value.

This represents a return of 14 times the investment! In most cases, this value would be realized during sellout, through higher sales rates rather than higher prices.

#### Common concerns regarding natural surface trails

"We don't have enough land." Trails are best built on slopes where homes are not built, so little land is lost. You might also look outside your property. With some effort and a little cash, you may be able to get easements across the neighbor's property as long as you are willing to let them use your trails.

"What about liability?" Most liability is covered by the Recreational Use Statutes in your state. Whatever liability is left can be covered reasonably by insurance. See [Trailscape.net](http://Trailscape.net) for a link.

"Our land is flat." Natural surface trails are not a great option on flat land; however, if you have a way to generate excess dirt (such as by digging a lake) you can use the dirt to build a large enough berm to make natural surface trails.

"We only have a few lots." Natural surface trails start to make financial sense with as few as 10 home sites.

It has been our experience that developers often assume that existing farm or fire roads on adjacent land will suffice as trails. While any access to nature will be greatly appreciated, trails that have been designed and engineered to meet the needs of a wide variety of user groups will maximize the value to the customer.

#### Cost/Benefit (800 UNIT DEVELOPMENT SPRINGVILLE, CALIFORNIA)

IMPROVEMENT	UNITS	PER	UNIT COST	TOTAL
Trail Construction	8	mile	\$40,000	\$320,000
100-foot Bridge	100	foot	\$1,000	\$100,000
Design				\$50,000
Contingency				\$50,000

**COST PER HOUSING UNIT \$450**

**\$520,000**

REVENUE	INCREASED UNIT VALUE	UNITS	TOTAL VALUE
3% Increase in Base Price (\$300,000)	\$9,000	800	\$7,200,000

#### OTHER FINANCIAL BENEFITS

- A 15% Velocity increase would significantly effect IRR for the Builder which directly effects land value
- Helps answer the question: are people really going to come to Springville?

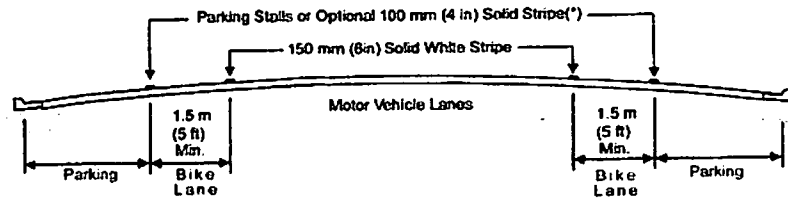
If executed well, people will drive across town to experience the trails. Trails can also provide an alternative transportation network to schools, shopping, or visits with neighbors—that can address the concerns of the growing segment of the population that is eager to reduce car trips because of high gas prices and environmental issues.

Great trails require thoughtful design and construction by people who are specifically trained and experienced in the engineering of sustainable trail networks. In addition, having an experienced marketing company demonstrate the benefits of trails will help maximize the value. The bottom line is that there is no better low-cost/high-impact amenity than natural surface trails. Trailscape has developed experience and expertise implementing a sought-after trail system in several communities.

#### About the Author

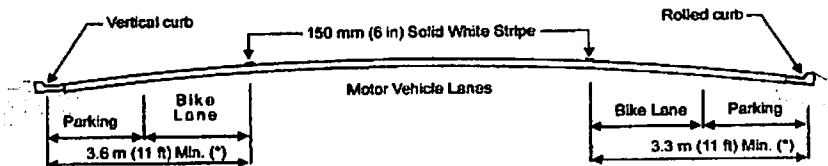
Randy, an avid cyclist and trail runner, is a development partner on two California projects on the edge of the Sierras where natural surface trails are a primary amenity. He can be reached at [Randy@trailscape.net](mailto:Randy@trailscape.net) or (520) 852-5155. The website is at [Trailscape.net](http://Trailscape.net) and several movies are available at [www.youtube.com/trailscape](http://www.youtube.com/trailscape).

## Appendix H. Typical Bike Lane Cross Sections



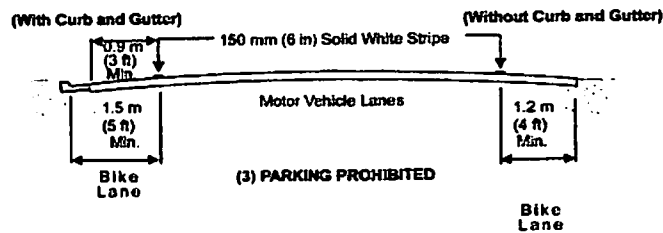
\* The optional solid white stripe may be advisable where stalls are unnecessary (because parking is tight) but there is concern that motorists may misconstrue the bike lane to be a traffic lane.

(1) ON-STREET PARKING

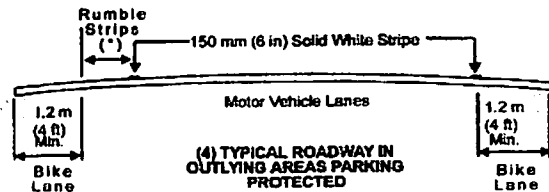


\*3.6 m (12 ft) is recommended where there is substantial parking or turnover of parked cars is high (e.g. commercial areas).

(2) PARKING PERMITTED WITHOUT PARKING STRIPE OR STALL



(3) PARKING PROHIBITED



\*If rumble strips exist there should be 1.2 m (4 ft) minimum from the rumble strips to the outside edge of the shoulder.

From American Association of State Highway and Transportation Officials (AASHTO), Guide for the Development of Bicycle Facilities, 1999

## **Appendix I. Trail Standards and Specifications**

(Note: The following information was assembled from the Gallatin County Trails Report and Plan and the Big Sky Master Plan for Trails and Parks, and is commonly accepted guidance for trail construction and maintenance. However, these guidelines should be critically assessed and modified as needed.)

**Trail Use Classification and Characteristics.** Trails are classified as to the intensity and type of use. As changes dictate, a trail may be upgraded in classification to meet new user demands.

Class I - Heavily used, generally full access, multiple non-motorized use, main corridor trails designed for recreational and commuter use. Designed to permit two-way traffic using a wide surfaced tread, or parallel treads; one surfaced and the other unsurfaced. ADA degree of access: easier.

Class II - Moderate use, multiple non-motorized use, local and connector trails designed for commuter and recreational use. Class II trails are not specifically designed for full access and may or may not be surfaced. ADA degree of access: moderate.

Class III - Low use, long distance connector trails designed primarily for recreational use by hikers and all-terrain bicycles. Trails limited to pedestrian traffic in sensitive locations, such as wetland nature education areas. Trails are designed to minimum standards striving

for low maintenance and minimal disturbance to the natural setting. ADA degree of access: difficult to most difficult.

### **Trail Design Standards**

#### Class I Trails

1. Single surfaced tread with a minimum width of eight feet. Parallel treads (surfaced and unsurfaced will have minimum widths of eight feet and four feet, respectively. Tread width may be reduced to 36 inches for a maximum distance of 10 feet to pass or preserve significant features such as rock formations, important vegetation, etc.
2. Tread surface will be asphalt, concrete, pavers set on concrete, wood decking, natural fines, or a well maintained compacted crushed gravel mixture meeting the aggregate specification in this appendix. The tread material including any base course will have a total minimum thickness of six inches. Wood deck planks must be run perpendicular to the direction of travel and joints must not exceed 36 inch. Planks must be securely fastened so they do not warp.
3. The minimum cleared zone will be tread width plus 2 feet to either side of the tread and 10 feet vertical.
4. Maximum sustained running grade is 5%. A 10% maximum grade is allowed for a maximum distance of 30 feet.

5. Tread will be raised above adjacent surfaces and have a 1 to 2 inch crown. Where this requirement is not possible, the tread will have a 1 to 20 cross slope and/or side ditches outside the cleared zone. Stream crossings will be over culverts or bridges. Only dips or slot-entrance drainpipe will be used for crosstread water stops.

6. Wood chips are not an acceptable tread material for Class I trails.

7. Geo-textile material as specified in this appendix will be placed beneath the tread material in poorly drained, boggy or marshy areas, or wet meadows and on any of the following soil types; clays, clayey loams, silts, silty loams, or loess.

8. Adequate visibility for safety.

9. The minimum acceptable trail easement width is 25 feet.

10. Trail entrances will be signed describing the degree of ADA access.

11. All above items may be modified to meet current ADA specifications.

### Class II Trails

1. Single surfaced or unsurfaced tread, five foot minimum width. Tread width may be reduced to 32 inches for a maximum distance of 30 feet to pass or preserve

significant features such as rock formations, important vegetation, etc.

2. A gravel or particulate tread surface will be a minimum of six inches thick. Native soil tread is acceptable only where the soil will allow all-weather use with minimal

environmental impact. Class II trails or portions of trails designed for ADA access will be surfaced with a minimum of wood decking as described under Class I, natural fines, or with a well maintained compacted crushed gravel meeting the aggregate specifications in this appendix.

3. The minimum cleared zone will be tread width plus one foot to either side of the tread, and ten feet vertical.

4. Grades will be 15% or less. Class II trails or portions of trails designed for ADA access will have a maximum sustained running grade of 8% and a 14% maximum grade is allowed for a maximum distance 50 feet.

5. Tread will be raised above the adjacent surfaces and have a 4 inch crown. Where this requirement is not possible the tread will have a 1 to 20 cross slope and/or side ditches outside the cleared zone. Stream crossings will be over culverts or bridges. Only dips, slot-entrance drain pipe, or rubber belting will be used for cross-tread water stops.

6. Wood chips are not an acceptable tread material for Class II trails.

7. Geo-textile material as specified in this appendix will be placed beneath any gravel or particulate tread material in poorly drained, boggy or marshy areas, or wet

meadows and on any of the following soil types: clays, clayey loams, silts, silty loams, or loess.

8. Adequate visibility for safety.

9. The minimum acceptable trail easement width is 25 feet.

10. Trail entrances will be signed describing the degree of ADA access.

11. All above items may be modified to meet current ADA specifications.

### Class III Trails

1. Single tread of a minimum 18 inch width. Class III trails or portions of trail designed for ADA access will be a minimum width of 28 inches.

2. No surfacing is required except in erosion prone poorly drained, boggy or marshy areas, or wet meadows.

3. Minimum cleared zone is tread width horizontally and seven feet vertically.

4. Maximum of 20% grades unless restricted by erosive soils, etc. Class III trails or portions of trails designed for ADA access will have a maximum sustained running grade of 12% and a 20% maximum grade is allowed for a maximum distance of 50'.

5. Utilize grade dips, cross sloping, and water bars to minimize erosion.

6. Blending the trail into the setting is emphasized in trail routing.

7. The minimum acceptable trail easement width is 25 feet.

8. Wood chip tread materials are acceptable when traffic is limited to pedestrian traffic in sensitive locations such as in wetland nature education areas.

9. All above items may be modified to meet current ADA specifications.

### **Summary Table of Trail Design Standards**

Item	Class I	Class II	Class III
Level of access:	Easy	Moderate	Difficult
Tread width (minimum):	8 feet	5 feet	18 inches (ADA regulation=32 inches)
Clear width (minimum, to each side of tread):	2 feet	1 foot	1 foot



Clear height (minimum):	10 feet	10 feet	7 feet
Sustained running grade (maximum):	5%	8%	12%
Maximum grade allowed:	10%	14%	20%
For a maximum distance of:	30 feet	50 feet	50 feet
Cross slope (maximum):	3%	5%	8%
Passing space interval (maximum):	200 feet (NR)	300 feet (NR)	400 feet
Suggested rest area interval (maximum):	400 feet	900 feet	1200 feet
Trail easement width (minimum):	25 feet	25 feet	25 feet

NR = Not Required by ADA specifications

Note 1: Tread width may be reduced to evade or preserve significant trail features such as rock formations, important vegetation, or the like. However, on ADA designated trails or portions, this reduction cannot be less than 32 inches and may not extend beyond 20 feet.

Note 2: No more than 20% of the total trail length shall exceed the sustained running grade.

Note 3: When measuring for ADA specifications, the calculation of maximum grade and cross slope should be established over a 24 inch interval to correspond with the rotation of a wheelchair in that environment.

Note 4: The above items may be modified to meet current ADA specifications.

**Acceptable Surface Material** - The following table lists suitable surfacing materials for each trail class. However, the purpose, use, environment, and existing tread surface of a trail must also be taken into account when choosing the best material.

Material	Class I	Class II	Class III
Native:		<input type="checkbox"/>	<input type="checkbox"/>
Pit-run fines:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gravel mixture:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Asphalt:	<input type="checkbox"/>		
Concrete:	<input type="checkbox"/>		
Wood decking:	<input type="checkbox"/>	<input type="checkbox"/>	
Base course and thickness (minimum):	6 inches	6 inches	

Note 1: Geo-textile material will be placed beneath the surface matter in areas that are poorly drained, marshy, and generally wet. Soil types with loose silt, shale, clay, or similar unstable textures will also require this material for stabilization.

Note 2: When wood decking is used, the planks must be run perpendicular to the direction of travel and joints must not exceed 36 inches. The planks must also be securely fastened so they do not warp or shift.

Note 3: Surfacing materials shall be free of vegetable matter, balls of clay, frozen lumps, or other unsuitable substances.

Note 4: No combination of shale, clay, coal, or soft particles shall exceed 3.5% by weight.

Note 5: The material shall be evenly graded.

Note 6: The material shall contain enough binder fines for good compaction.

Note 7: All material shall be certified by the sponsoring company as acceptable for the proposed use under these requirements.

**Trail Maintenance Standards.** The intent of these maintenance standards is to maintain the trails to their design standards, for public safety, and for meeting ADA access requirements. (Note: These maintenance standards are ambitious. Some communities have found the prescribed frequency of maintenance activities excessive.)

#### Class I Trails

1. The clear 2 foot minimum clear zone on either side of the tread will be mowed a minimum of 3 times per year. Nominally, mowing will be done once per month in June, July or August, and in September. Late fall mowing may be needed for trails being used for skiing. Mowing times should be chosen to maximize weed control.

2. Gravel tread surfaces will be reconditioned a minimum of twice annually to reincorporate loose surface gravel, to uproot vegetation growing in the tread as an alternative to chemical control, to reshape the tread surface for drainage, and to regrade and recompact the tread surface for ADA access and public safety.

3. Noxious weed control in the trail corridors will be by hand pulling, cutting, burning or biological control. Chemical control will be used only as the last resort.

4. Class I trails will be inspected at least quarterly to insure timely maintenance of the tread surface, erosion controls, signage, fencing, drainage, and of any structural features such as benches, bridges, etc. Inspections should be made at critical times of the seasons, such as during thaws, chinooks, or heavy runoff periods.

#### Class II Trails

1. The clear 1 foot minimum clear zone on either side of the tread will be mowed a minimum of 3 times per year. Nominally, mowing will be done once per month in June, July or August, and in September. Late fall mowing may be needed for trails being used for skiing. Mowing times should be chosen to maximize weed control.

2. Gravel tread surfaces will be reconditioned a minimum of biannually to reincorporate loose surface gravel, to uproot vegetation growing in the tread as an alternative to chemical control, to reshape the tread surface for drainage, and to regrade and recompact the tread surface for public safety and ADA access.

3. Noxious weed control in the trail corridors will be by hand pulling, cutting, burning, or biological control. Chemical control will be used only as -the last resort.

4. Class II trails will be inspected at least quarterly to insure timely maintenance of the tread surface, erosion controls, signage, fencing, drainage, and of any structural features such as benches, bridges, etc. Inspections should be made at critical times of the seasons, such as during thaws, chinooks, or heavy runoff periods.

#### Class III Trails

1. Vegetation growing in the tread or overhanging the edge of the tread will be cut or mowed twice per year at times determined to be the most beneficial for safe passage of the public.

2. Tread that has been surfaced with particulate materials (i.e. gravel, crushed brick, wood chips) will be reconditioned by replenishing the surface material and by raking as needed.

3. Erosion controls will be maintained in an effective condition.

4. Class III trails will be inspected at least twice annually to insure timely maintenance especially of the erosion controls. Inspections should be made at critical times, such as during the spring thaw or heavy runoff periods.

#### **Trail Construction Material Specifications**

1. Aggregates for Class I Trails will meet the following requirements:

a. Aggregate surfacing materials shall be free from injurious quantities of vegetable matter, balls of clay, frozen lumps, or other extraneous matter.

b. No combination of shale, clay, coal, or soft particles shall exceed 3.5% by weight.

c. The material shall be evenly graded.

d. The material shall contain enough binder fines for good compaction.

e. The liquid limit for that portion of the fine aggregate passing the No. 40 sieve shall not exceed 25 and the plasticity index shall be between 5 and 10.

f. A tolerance of 5%, by weight, up to the next above specified gradation (for example: 1/2 inch for 3/8 inch max) will be allowed.

g. Upon approval of the Engineer, small quantities of gravel which contain oversize material may be placed on the trail surface. The gravel so placed shall then be mechanically worked (raked) to remove the oversize rock which shall be gathered and removed from the project or used for erosion control.

h. All material shall be furnished with a written certification from an approved testing laboratory stating that the material proposed for use meets or exceeds the requirements of these specifications.

i. The material will meet the following gradations

Percentage by Weight Passing Square Mesh Sieves

Passing	Crushed top surfacing	Crushed base course	Pit run gravel base course
3 inch sieve			
2 inch sieve			100%
1 inch sieve		100 %	
1/2 inch sieve			
3/8 inch sieve	100 %		
No. 4 sieve	50-80 %	25-60%	
No. 10 sieve	35-70%		
No. 200 sieve	8-15 %	6-12%	10-15%

2. Asphalt for Class I Trails: (to be completed as needed)

3. Concrete for Class I Trails: (to be completed as needed)

4. Acceptable aggregate or particulate surfacing materials for Class II and Class III Trails are:

a. Preferred - "Natural fines", "3/8 inch minus with binder fines".

b. Acceptable - Well graded road mix with a maximum particle size of 1/2 inch and a maximum 15% by weight of fines passing the No. 200 sieve.

- Railroad cinders.
- Crushed brick with a maximum particle size of 1/4 inch.
- Old existing gravel roads and railway beds with greater than 3/4 inch oversize removed from the surface.

c. Special - Wood chips are acceptable for only Class III trails limited to pedestrian traffic in sensitive locations, such as in wetland nature education areas.

5. Geo-textiles for all Classes of Trails:

a. The preferred geo-textile is a continuous filament non-woven needle-punched

engineering geo-fabric.

b. An acceptable geo-textile is a woven engineering geo-fabric.

c. Minimum geo-textile requirements:

Property Non-woven Woven

Mass per unit area (ASTM D-3776) 4 oz/sqyd N/A

Thickness (ASTM D-1777) 60 mils N/A

Flow Rate (ASTM D-449) 100 gpm/sqft 40 gpm/sqft

Puncture Resistance (ASTM D-3787) 50 lbs 70 lbs

Trapezoid Tear Strength (ASTM D-4533) 40 lbs 45 lbs

Grab Tensile Elongation (ASTM D-4632) 100 lbs@60%  
140 lbs@15%

**Specifications for Pedestrian Bridges (ADA compliant)**

1. Minimum width shall be 36 inches for bridges 20 feet or less in length and 72 inches if length exceeds 20 feet (to allow for wheelchair turnaround and passing).
2. If height of bridge is more than 30 inches (from bridge deck to bottom of watercourse), a protective rail is required.
3. Rails are to be 42 inches high, with at least one midrail at 34 inches, to be used as a handrail.
4. Rails must have a protective barrier, with spacing being no more than 4 inches at any point.



5. If bridge does not require a rail, it must have a 4 inch high curb on both sides along entire length of bridge.
6. All bridges to be installed on public lands must be certified by a licensed civil or structural engineer.
7. Deck should be constructed of durable, weather-resilient, slip-resistant material.
8. Deck of bridge shall not exceed a 12 to 1 slope along any part of its length.
9. The deck surface between the ends of the bridge shall not vary from a flat plane by more than a ½ inch.
10. Cross slope of the deck shall not exceed 3%.
11. The vertical approach at either end of a bridge shall not exceed 1 inch.

#### **Specifications for Class II trails (Construction Handout)**

1. Trail width shall be a minimum of 60 inches (5 feet)
2. Trail bed must be excavated 4 to 6 inches deep, prior to installation of tread mix
3. Geo-textile weed mat is optional, depending onto what the tread mix is applied (see #7, Class I and II Trail Design Standards above)
4. Tread mix shall be 3/8th inch minus gravel (natural fines) with 15% clay binder

5. If mix does not contain enough clay binder, additional clay must be mixed in
6. Tread mix must be rolled and compacted after installation, maintaining 4 inch crown (If moisture content is not adequate for compaction, water should be added prior to rolling and compacting)
7. All damage to surrounding features and/or vegetation shall be reclaimed immediately
8. Encroaching weeds, due to trail construction, shall be treated and controlled for a minimum of 2 years after trail section is completed.

## Appendix J: Maintenance Checklist for Greenways and Urban Trails

### Trail Maintenance and Management

by AmericanTrails.org

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#### MAINTENANCE CHECKLIST for GREENWAYS and URBAN TRAILS

Denver has 130 miles of paved trails, open 24 hours a day and maintained for year-round use. Snow removal begins at 5 a.m. after winter storms.

By Jed Wagner, Denver Parks and Recreation Department



#### Maintenance to be performed on a continuous, scheduled basis:

##### 1. Trail user safety

Safety is central to all maintenance operations, and is the single most important trail maintenance concern. Items for consideration include scheduling and documentation of inspections, the condition of railings, bridges, and trail surfaces, proper and adequate signage, removal of debris, and coordination with other agencies associated with trail maintenance.

##### 2. Trails inspection

Trails inspections are integral to all trail maintenance operations. Inspections will occur on a regularly scheduled basis, the frequency of which will depend on the amount of trail use, location, age, and the type of construction. All trail inspections are to be documented.



Denver's Cherry Creek Trail provides a streamside trail through the heart of the city.

##### 3. Trail sweeping

Trail sweeping is one of the most important aspects of trail maintenance, helping ensure trail user safety. The type of sweeping to be performed depends on trail design and location. Trails that require sweeping of the whole system will be swept by machine. Trails that require only spot sweeping of bad areas will be swept by hand or with blowers. Some trails require a combination of methods. Sweeping will be performed on a regular schedule.

##### 4. Trash removal

Trash removal from trail corridors is important from both a safety and an aesthetic viewpoint, and includes removing ground debris and emptying trash containers. Trash removal will take place on a regularly scheduled basis, the frequency of which will depend on trail use and location.

##### 5. Tree and shrub pruning

Tree and shrub pruning will be performed for the safety of trail users. Pruning will be performed to established specifications on a scheduled and as needed basis, the frequency of which will be fairly low.

##### 6. Mowing of vegetation

Trails maintenance personnel will mow vegetation along trail corridors on a scheduled basis only where mowing is not performed by other agencies or park districts.

##### 7. Scheduling maintenance tasks

Inspections, maintenance, and repair of trail-related concerns will be regularly scheduled. Inspection and repair priorities should be dictated by trail use, location, and design. Scheduling maintenance tasks is a key item towards the goal of consistently clean and safe trails.

#### Maintenance to be performed on an irregular or as needed basis:

##### 1. Trail Repair

Repair of asphalt or concrete trails will be closely tied to the inspection schedule. Prioritization of

repairs is part of the process. The time between observation and repair of a trail will depend on whether the needed repair is deemed a hazard, to what degree the needed repair will affect the safety of the trail user, and whether the needed repair can be performed by the trails maintenance crew or if it is so extensive that it needs to be repaired by outside entities.

##### 2. Trail Replacement

The decision to replace a trail and the type of replacement depends on many factors. These factors include the age of the trail, and the money available for replacement. Replacement involves either completely overhauling and asphalt trail with a new asphalt surface, or replacement of an asphalt trail with a concrete trail. In general, replacing asphalt trails with concrete is desirable. [A discussion of the different philosophies concerning the replacement of an asphalt trail with a concrete surface can be found elsewhere in the Bicycle Master Plan.] Parks Planning will coordinate all trail replacement, and the Trail Coordinator will recommend trails for replacement.

##### 3. Snow and ice removal

The trails maintenance crew, with the help of the various districts, will remove snow from all city trails as soon as possible after a snowfall. The trails crew will provide help as needed to any district. Ice control and removal of ice build-up on trails is a continual factor because of the freeze-thaw cycle. Ice control is most important on grade changes and curves. Ice can be removed or gravel/ice melt applied. After the ice is gone, leftover gravel should be swept as soon as possible.

##### 4. Weed control

Weed control along trails will be limited to areas in which certain weeds create a hazard to users (such as "potheads" thorns along trail edges). Environmentally safe weed removal methods should be used, especially along waterways.

##### 5. Trail edging

Trail edging maintains trail width, and improves drainage. Problem areas include trail edges where berms tend to build up, and where uphill slopes erode onto the trails. Removal of this material will allow proper draining of the trail surface, allow the flowing action of the water to clean the trail, and limit standing water on trail surfaces. Proper drainage of trail surfaces will also limit ice build-up during winter months.

##### 6. Trail drainage control

In places where low spots on the trail catch water, trail surfaces should be raised or drains built to carry away water. Some trail drainage control can be achieved through the proper edging of trails. If trail drainage is corrected near steep slopes, the possibility of erosion must be considered.

##### 7. Trail signage

Trail signs fall into two categories: safety and information. Trail users should be informed where they are, where they are going, and how to use trails safely. Signs related to safety are most important and should be considered first. Information signage can enhance the trail users' experience. A citywide system of trail information signage should be a goal.

##### 8. Revegetation

Areas adjacent to trails that have been disturbed for any reason should be revegetated to minimize erosion.

##### 9. Habitat enhancement and control

Habitat enhancement is achieved by planting vegetation along trails, mainly trees and shrubs. This can improve the aesthetics of the trail, help prevent erosion, and provide for wildlife habitat. Habitat control involves mitigation of damage caused by wildlife. An example is the protection of trees along waterways from damage caused by beavers.

##### 10. Public awareness

Creating an understanding among trail users of the purpose of trails and their proper use is a goal of public awareness. Basic concepts of trail use include resolution of user conflicts, and speed limitations. The representatives should be easily accessible to field questions and concerns.

##### 11. Trail program budget development

A detailed budget should be created for the trails program, and revised on an annual basis.

##### 12. Volunteer coordination

The use of volunteers can help increase public awareness of trails, and provide a good source of labor for the program. Sources of volunteers include Boy Scouts, school groups, church groups, trail users, or court workers. Understanding volunteers' concerns is important, as are possible incentives or recognition of work performed. Implementation of an "Adopt-a-Trail" program should be considered.

##### 13. Records

Good record-keeping techniques are essential to an organized program. Accurate logs should be kept on items such as daily activities, hazards found and action taken, maintenance needed and performed, etc. Records can also include surveys of the types and frequency of use of certain trail sections. This information can be used to prioritize trail management needs.

#### 14. Graffiti control

The key to graffiti control is prompt observation and removal. During scheduled trail inspections any graffiti should be noted and the graffiti removal crew promptly notified.

#### 15. Mapping

Several maps are privately marketed and available for trail users. From a maintenance standpoint, an accurate, detailed map of the trail system is important for internal park use.

#### 16. Coordination with other agencies

Maintenance of trails located within more than one jurisdiction, like the Platte River Trail and the High Line Canal Trail, is provided by other agencies, in addition to Denver Parks Department. A clear understanding of maintenance responsibilities needs to be established to avoid duplicating efforts or missing maintenance on sections of the trails.

#### 17. Education and interpretation

Many segments of the trail system contain a wealth of opportunities for education and interpretation. A successful example is Denver Public Schools' Greenway Experience, operated for many years. Trails along waterways provide good opportunities to teach and study concepts about urban wildlife and ecology. Educational opportunities range from interpretive signage to educational tours.

#### 18. Law enforcement

A greater law-enforcement effort might be made toward the goal of a safer trail system. Law enforcement agencies should be aware about the location of trails, and the types and levels of use they receive. Sections of trail corridors being used by transients is an ongoing problem that is not easily solved. Increased law enforcement awareness will be addressed on an as needed basis.

#### 19. Proper training of employees

Properly training maintenance employees is essential to the efficient operation of the trails maintenance program. All employees should be thoroughly trained to understand and be aware of all of the above-mentioned aspects of trail maintenance. Safety, a good work ethic, and proper care of equipment and tools will always be the backbone of a good training program. Employees must also be aware of the need for positive public contact. Proper positive attitude towards public questions and concerns is important, as is the conveyance of this information to trail supervisors.

Jed Wagner was for several years the supervisor of Denver's Trail Maintenance Program. This article was written in 1999.

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Updated March 18, 2007

## **Appendix K. Weed Management**

(Note: The following information was assembled from the Big Sky Master Plan for Parks and Trails)

Eleven basic elements comprise this plan:

- Setting objectives
- Prevention of new infestations
- Early detection
- Education
- Mapping
- Baseline monitoring
- Control actions
- Revegetation with native species
- Response monitoring
- Review and Reevaluation
- Cooperation
- Existing Vegetation

### **Setting Objectives**

General objectives for these lands were identified in the main document. More detail for each property will be developed for the specific sites.

### **Prevention of New Infestations**

The single most effective method of managing noxious weeds is to prevent them from establishing. The success of this method will depend on public education on ecology of weeds, their spread, and their impacts to biodiversity and wildlife habitat. Success also requires keeping field

equipment and vehicles clean of weed seeds and treating existing infestations so that they do not spread into new areas.

### **Early Detection**

Following prevention, early detection is important for effective noxious weed control. When infestations are small, there are far more options for successful control, and control at this stage is less expensive. If plants are not detected until they reach a population of several thousand, successful control is unlikely without the use of herbicides or mowing. At this point, follow-up treatments are almost always necessary and tend to be quite arduous.

### **Education**

Education for the general public, decision-makers, and professional land managers is essential for proper weed management. Employees and volunteers responsible for implementing the vegetation management plan must receive annual training to acquire and execute new technologies as they become available, as well as share experiences with others involved in weed eradication.

As with all long-term ecological problems, resolution is unlikely unless the public is educated and aware of the problem and possible solutions. If people do not appreciate negative impacts of noxious weeds on the regional ecology, it is very unlikely that there will be support for the objectives outlined in this plan.

Public education must entail informational signage at trailheads, field trips for adults and schools, press

releases, Internet resources, and public presentations. With added public involvement, daily users will be more aware of weed issues, therefore becoming an important source of early detection for weed infestations.

### Mapping

Weeds must be mapped at regular intervals (such as every five years) so that progress can be assessed and strategies developed. The Montana State Weed Mapping Guidelines will be utilized and managed with Arc View's geographic information systems software.

### Baseline Monitoring

Before management activities are initiated, pre-treatment data must be collected from established monitoring sections so that changes over time can be determined. This is a way of measuring progress at a finer scale than at the mapping scale. Permanent monitoring transects or plots will need to be established at each property.

### Control Actions

Several actions can be taken to control weeds and each will be considered on a site-by-site basis when executing this plan.

#### ➤ *Hand pulling*

A useful method for dealing with small infestations, or those within a limited area. Hand pulling is most effective on tap rooted weed species such as knapweed and least effective on rhizomatous species such as leafy

spurge. Since this method is very time consuming when used to control more than a few plants, it is best accomplished with volunteer labor. Past labor sources have included community groups, school groups, Montana Conservation Corps, and public weed-pull days.

*Pros:* Non-toxic (excluding allergic reactions in many people), fun (for some people), results in education, can be very selective in the appropriate conditions.

*Cons:* Can result in disturbed bare ground (providing space for more weeds) and trampling of non-target species, also labor intensive.

#### ➤ *Mowing*

A useful tool to reduce flowering incorporated with the spread of seeds, and may be helpful in conjunction with other tools, especially biocontrols and herbicide application.

*Pros:* Non-toxic (excluding CO emissions), reduces seed production.

*Cons:* Non-specific (can be detrimental to non-target species), does not destroy weeds, just suppresses them.

#### ➤ *Biological control agents*

Biocontrols employ insects or grazing animals that are the "natural enemies" of the pest plants. Insects are generally recovered from the same area as the invading plant, screened for specificity, and eventually released onto the invading colony. Grazing animals are also



researched in advance and then released onto designated plots to confine grazing. The goal of biocontrol programs is to reduce the pest plant density to an acceptable level so that desirable vegetation can respond positively, not to eradicate the population.

Biocontrols are an appropriate means for addressing long-term control over large, established weed infestations of which there is little chance for permanent removal. This method is not suitable for small, new infestations that may be eliminated by another process.

Although biocontrols are often promoted as possessing a lower environmental risk than herbicides, it is important to note that there is a tremendous degree of uncertainty involved in the release of "foreign" insects or animals onto an area. Although these controls are screened to ensure proper management, there is no way to test for the impact on trophic level interactions (interactions between different levels in the food chain, such as between plants and herbivores or insects and birds).

Since biocontrols require specialized knowledge for proper application, BSCC will contract a recognized expert biocontrol company such as: Integrated Weed Control, 4027 Bridger Canyon Road, Bozeman, MT 59715 or a similar business.

*Pros:* Non-toxic, offers potential for long-term control after release and can cover a large area.

*Cons:* Some degree of ecological risk, takes a long time to show results, labor intensive, non-specific

(may impact native plant species), concern of disease transmission to wildlife/animals, possible erosion problems if grazing animals are mismanaged.

#### ➤ *Herbicides*

The use of all herbicides will be coordinated with and recommended by the appropriate county weed control district agent. Herbicides will be ground applied by truck, ATV, pack stock, or backpack by licensed/certified contractors or staff.

This management plan will not solely rely on applications of broadleaf herbicides at 3-5 year intervals. Such an approach may ultimately result in the loss of native plant diversity. This plan advocates complementing herbicide treatments with biological controls, mechanical approaches, re-vegetation, and cultural methods in order to disperse the treatment interval and reduce reliance on herbicides. Additionally, spot treatments are preferred over broadcast treatments, when feasible, to minimize impacts on non-target species.

Adequate public notification will accompany herbicide applications, including visible signage at trailheads and at the site of application.

A protocol must also be developed in cooperation with the extension office to determine if soils are geologically appropriate for herbicide application on each site.

*Pros:* High degree of control in a short time period, long interval between treatments, may be applied to

large acres quickly, minimal ground disturbance and erosion.

*Cons:* Toxic, varying degree of impact on native vegetation (depending on rate of application and product used).

### Revegetation with Native Species

Depending on the severity of the noxious weed infestation at a given site, revegetation may or may not be required. Typically, revegetation is recommended if the cover by desirable species is less than 30% at the time of weed control.

To preserve genetic diversity and ensure that the plants used in revegetation projects are adapted for local conditions, it is important to use local ecotypes of native species. Essentially, ecotypes are populations of a plant species that are genetically adapted for a given set of conditions. Depending on a site's specific needs and available product, seed choices are listed below. The most desirable options are listed first and the least desirable follow.

1. Local ecotypes of native species (less than 100 miles from the area)
2. Similar ecotypes of native species (over 100 miles from the area, similar region)
3. Commercial-source seeds of native species
4. Commercial- source, cultivars of native species
5. Native species that are not found on the project areas

6. Non-native species that do not reproduce beyond the first growing season.

Non-native, persistent species should never be used. They do not promote the management goals of restoring and preserving native species.

### Response Monitoring

Data from permanent research plots established for baseline monitoring will be collected after control treatments have been applied. This will allow for an accurate evaluation of changes in vegetation in response to weed control efforts.

### Review and Re-evaluation

Re-evaluation provides for adaptive management in which past experience may be utilized to determine appropriate modifications of future actions. An annual review of this management plan is also necessary to settle any issues and improve controls.

### Cooperation

Communication and active cooperation with neighboring landowners and local agencies will ensure maximum efficiency of vegetation management efforts. The implementing agency will work with the Park County Weed Control District, the Gallatin National Forest, other agencies, and independent researchers to pursue new technologies and new information on effective weed control methods.

# Appendix L. The Use of Domestic Goats and Vinegar as Municipal Weed Control Alternatives

## RESEARCH ARTICLE

### The Use of Domestic Goats and Vinegar as Municipal Weed Control Alternatives

Anne E. Booth, Norman W. Skelton

This article presents the results of a two year pilot case study of alternative weed control in a northern Canadian community. Investigators tested the efficacy of acetic acid (vinegar) and a domestic herbivore (goats) as invasive weed control alternatives to the use of commercial herbicides in a north central British Columbian municipal setting. Results were positive for using an 8% concentration of vinegar as a control for Canada thistle (*Cirsium arvense* (L.) Scop.), although these results were significant only in the second year of application. Domestic goats demonstrated significant interest in thistle, as well as hawkweed (*Hieracium* spp.), two species of horsetail (*Equisetum arvense* and *Equisetum pratense*), curly daisies (*Helianthemum vulgare*), and the common dandelion (*Taraxacum officinale*). Cost estimates suggest that over a five year period, both methods are as cost effective as single application herbicides, while posing fewer concerns over impacts on human and ecosystem health. Both are simple solutions easily implemented, with some planning, even by small municipalities and communities.

Environmental Practice 11:13-16 (2009)

The last decade has witnessed a change in governments' and the public's comfort level regarding the use of herbicides to control weeds. This manifests in a number of ways, ranging from an interest in organics to government bans on the cosmetic use of herbicides and pesticides. For example, in 2005, France passed a country-wide ban on the use of certain herbicides and pesticides (Environmental News Network, 2005), while Canadian provinces are considering similar actions (Reck, 2006). The

Canadian Press, 2005). Concerns are growing over the impacts of chemical herbicides and pesticides on the health of humans, non-humans, and ecosystems; however, agencies also need to control unsightly or noxious invasive weeds. Although conventional herbicides have a role to play in weed control, alternative control mechanisms are needed. This article presents the results of a two year case study of alternative controls in a northern Canadian community.

In 2005, the City of Prince George, British Columbia, and the University of Northern British Columbia developed the Prince George Northern Sustainable Landscape Initiative (SLI), with the goal of exploring sustainable landscaping within the municipality, including alternative weed control options. Prince George, British Columbia, is a northern, resource-dependent community with a population of approximately 40,000, located 500 miles north of Vancouver, British Columbia. It sits within Canada's boreal forest and in Climatic Zone 4. Its northern location gives it cold (-15°C) winters, mild summers (22°C), and a relatively short growing season of 12 weeks. Snow accumulation averages two meters annually; however, climate change is affecting Prince George, creating both warmer winters and summers, leading to a rise in invasive weed species (Rebman, 2007). Further, Prince George faces the same challenges as most municipalities, including restricted budgets and a changing legal context around herbicide use, which has resulted in several Canadian municipalities passing herbicide bans. Thus, city employees were seeking more environmentally benign, socially acceptable, and cost effective weed control alternatives, particularly for Canada thistle (*Cirsium arvense* (L.) Scop.) and dandelions (*Taraxacum officinale*). Municipal staff members were interested in the use of acetic acid (commonly known as vinegar) and livestock.

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### Review of the Literature

The control of Canada thistle (Figure 1) is a research priority. An extremely invasive plant species, it is capable of crowding out native species and other plants (Sullivan, 2004). It has spread rapidly throughout the Prince George area (North West Invasive Plant Council, 2008). Although the annual application of conventional herbicides controls, but rarely eradicates, thistle, there are concerns about such herbicide use. Studies by the Canadian Association of Physicians for the Environment (CAPE) and others suggest that pesticides/herbicides are a leading cause of acute poisonings in Canada and can also cause chronic health effects, both as sequelae of acute poisonings and from chronic exposure (Canadian Association of Physicians for the Environment, 2008; Union of Concerned Scientists, 2008; see also Daniels, Oshian, and Savitz, 1997; Ecotoxicity Canada, 2008; Infante-Rivad and Weichenhals, 2007; Radtke et al., 2007).

Research has suggested that vinegar is effective in controlling or eradicating thistle (Daniels, 2008; Sullivan, 2004; Webster, 2005; Webster and Shreffler, 2008a; Webster and Shreffler, 2008b; Webster et al., 2005), but this type of research has examined vinegar use in either an agricultural

or range setting. We were interested in its utility in a municipal setting, where public expectations might be very different; we were interested in impacts on adjacent vegetation, the use of readily available concentrations of vinegar, and impacts of vinegar in a short growing and application season.

We also wished to experiment with livestock and weed control. Research suggests that three domestic livestock species control thistle: donkeys, sheep, and goats (Lauchbaugh, 2008). We chose to examine goats for experimental purposes.

There is a very modest literature on the use of goats for control of weeds, largely focused on leafy spurge (*Euphorbia esula*) (Dowd, Todd, and Richman, 2005; Hanson and Kirby, 1995; Lacey, Wallender, and Olson-Rutz, 1997; Lynn, Sedore, and Kirby, 1997; Prosser, Sedore, and Barker, 1997; Sedore, Barker, and Messinger, 1992; Sedore, Hanson, and Hewer, 1995; Sedore and Maine, 1991) and spotted knapweed (*Centaurea biebersteinii*) (Ernst and Lauchbaugh, 2000; Williams and Prather, 2008). The United States Department of Agriculture does cite the use of goats as a potential controller of thistle species (Sullivan, 2004; Webster, 2005). For well over 100 years, goats have been used to



Figure 1. Canada thistle. (Photograph: Adam Humphreys)

manage unwanted vegetation in the United States, including by the Army Corps of Engineers (Weisber, 2004). Goats can also assist in increasing the biodiversity of grasslands, as well as help heal gullies and washes (rest and launch benches, 2006), reducing water runoff and active erosion (Lundstrough, 2006). They do not pollute natural water sources with their waste (Cartowski, 2007) and reduce the production of weeds by consuming seedlings, which do not survive passage through the digestive tract. Through digestion, goats release plant nutrients tied up in unwanted vegetation (Clements and Young, 2005; Peterson Buffalo Ranch, 2006; Popay and Field, 1996). A final benefit of using goats to control vegetation is that while these animals consume undesirable plants, they are producing a salable product (milk, cheese, meat, and hides) (Peterson Buffalo Ranch, 2006). For our research, we were interested in the full range of weeds goats would consume, although thistle was of key interest. Further, we were interested in how well goats would adapt to a municipal setting. In 2006, the city of Seattle, Washington, began using goats for weed control on city grounds (Harrell, 2007; McDonald, 2007; Nieves, 2007; San Francisco and Los Angeles, California, also use goats, but no research exists confirming their effectiveness in a municipal setting).

## Project Methods

### Vinegar Trials

We conducted three years of experimentation with the use of vinegar at Moore's Meadow, a city park with extensive thistle infestation. The City does not employ herbicides on this park, as it is an off-leash dog park. A little moraine, the park is an elongated bowl with wooded sides and a grassy bottom, which is a mix of weeds, *Phalaris frutescens* (timothy grass) and *Bouteloua curtipendula* (bromet). The City mows the bottom periodically. The bottom is empty and moist.

The site was an open area divided on the long axis by a trail. Thistle was abundant. In 2006, we established our test site, consisting of two sections, one on each side of the trail. Each section consisted of six 15 meter  $\times$  6 meter plots with two inventory quadrants of 1 meter  $\times$  1 meter at each end of each plot.

Our key concern was whether vinegar application could be readily adopted by a cash- and time-strapped municipality; therefore, we based our trials on requirements city staff

estimated they might manage. After reviewing existing research, we chose two different concentrations of vinegar, 5% and 8%. Both concentrations were less than the more commonly tested concentrations, which required extensive safety precautions (possibly limiting municipal adoption). Based on estimates by city personnel, we chose two timing variables, every two weeks and every four weeks. We established five test sites: one on each side of the trail, one more every two weeks with 5% vinegar, treatment every two weeks with 8% vinegar, treatment every four weeks with 5% vinegar, and treatment every four weeks with 8% vinegar. To avoid mixing, one side of the trail was randomly assigned to 5% and the other to 8%. Plots on either side were randomly assigned as control, two week, or four week plots. Vinegar was applied by hand, using backpack sprayers at a constant rate and with an even application of 125 liters per section from a one meter height. Due to initial funding issues, applications began very late in June, well after the thistle was established.

For the 2007 trials, we modified our trials. We did not utilize control plots. Vinegar was applied as an 8% solution only. One section of plots was sprayed at two week intervals, randomly assigned, and a second set at three week intervals. We therefore had a series of test plots, as follows:

- 2006 no treatment/2007 application of 8% vinegar at three week intervals;
- 2006 application of 5% vinegar at two week intervals/ 2007 application of 8% vinegar at three week intervals;
- 2006 application of 5% vinegar at four week intervals/ 2007 application of 8% vinegar at three week intervals;
- 2006 application of 8% vinegar at two week intervals/ 2007 application of 8% vinegar at two week intervals; and
- 2006 application of 8% vinegar at four week intervals/ 2007 application of 8% vinegar at two week intervals.

In 2008, we wished to limit vinegar applications to determine thistle recovery rates, as well as to see whether a "maintenance" schedule was viable. Therefore, we sprayed all plots with 8% vinegar once in mid-May and once at the beginning of June, as plants were beginning their growth season.

Each year, assistants counted and recorded all plants within the inventory quadrants. All weed species were counted individually. In 2006, we conducted inventories in July and August. In 2007 and 2008, inventories occurred monthly, from mid-May to early September.

### Livestock Trials

In 2006, test plots were established at three city sewage lagoons. Sewage lagoons were selected for two reasons: herbicides could not be used in these areas and the sites were already partially fenced. One site subsequently was abandoned due to dog depredation on the goats. We were left with two sites, the Danson site (21,571.60 square meters, or 233,293 square feet) and the CN site (7,238.44 square meters, or 77,914 square feet). Both sites are located in an industrial zone adjacent to the Fraser River. Both sites normally were mowed once a year. Gravelly soil created poor growing conditions, although vegetation around the edges of the ponds was quite lush. Invasive weeds, particularly Canada thistle, were well established in several sections of the site, particularly within one-and-a-half-meter zones around the ponds. Other invasive species were present in extensive numbers, including *Lactuca scariola* (wild lettuce), native species of *Geranium* (cheekweed), *Limonium vulgare* (meyer daisy), and *Equisetum arvense* and *Equisetum pratense* (horsetail).

In 2007, the original plots were reorganized to more comprehensively capture the vegetation diversity at each site. At

Danson, we established four original plots and added an additional two. At the CN site, we started with four plots and added a fifth. All plots were 1 meter  $\times$  1 meter in size and were scattered across sites, both adjacent to the ponds and at a distance. Plant inventories were conducted at both sites—once in July 2006—as a baseline. In 2007 and 2008, inventories were conducted once in May, June, August, and early September. All plants within the test plots were individually counted and recorded. In addition, all plants were visually surveyed for evidence of grazing. Due to terrain difficulties, no safely accessible control plots outside the sites could be established.

Our livestock grazing trials began in 2007, using four domestic Boer goats (Figure 2). We intended to place them at the first green-up of the vegetation and rotate them between the two sites on at least a monthly basis, given estimation of available browse. Instead, the four goats did not start until early June. The Canada thistle was well established, aged, and not as palatable to the goats. The goats did not arrive at the CN site until mid-July, where a similar situation prevailed. We maintained continuous grazing of the Danson site until mid-September, adding an additional four goats from mid-August to mid-September.



Figure 2. A goat grazes a test plot of weeds in Prince George, British Columbia. (Photograph: Adam Humphries)

however, the CN site received a single month of grazing by four goats.

We had one further challenge at the Danson site. Due to a miscommunication with city personnel, approximately 75% of this site was mowed in early August, including several of our test plots. Although disrupting our data, it did demonstrate that the new growth of thistle that occurred within two weeks of mowing caused the goats to focus their grazing on thistle.

In 2008, we placed goats back on site in mid-May. We initially placed six goats at Danson and four at CN. In early August, the City mowed again at Danson, because the younger goats were not comfortable eating at the edge of the pond and had left a half-meter border of thistle at the pond edge (conversely, the mature, experienced goats at the CN site grazed right down to the water's edge). The six goats were relocated to CN and within three weeks, all grass was eliminated. We then transferred all ten goats back to Danson for two further weeks. The goats were permanently removed in mid-September.

## Results

### Vinegar Trials

During the first year of vinegar treatment, it appeared that vinegar was unsuccessful in controlling thistle. We saw no significant impact with our use of 5% vinegar, either at two or at four week application schedules. Indeed, thistle numbers actually increased, sometimes significantly so. The two most heavily infested sites saw plant numbers increase by 18% and 64%, respectively.

Our May 2007 inventory, however, demonstrated that in six out of eight plots treated with vinegar, thistle suffered significant over-winter mortality. Thistle numbers were reduced by anywhere from 60% to 80%, with two plots showing either a constant number or a modest rise (those sites received 5% vinegar applications during the first year). By the time of our June inventory, thistle survival was almost zero for all plots treated with vinegar. This held constant into September for the plots that received 8% at four weeks (2006) and 8% at two weeks (2007). Those that had received 8% at two weeks for both years showed very modest rebound. Our third year, with two spring vinegar applications, demonstrated some rebound in net thistle numbers. Rebound was greatest in plots receiving one year

of treatment, reaching almost 50% of original plant numbers. Plots that had received two years of vinegar applications showed much more modest rebound, ranging from 10% to 27%, on average. Figures 3 and 4 present results for thistle on all plots treated for two years with vinegar. (Dual letter/number combinations for plot identification, as seen in the figure legends, are a result of plots being re-labeled from 2006 to 2007; i.e., each plot had two sets of numbers assigned to it for tracking purposes.)

The results for one of our former control plots confirm that 8% vinegar applied at three week intervals on a "new" site also resulted in a significant reduction of thistle by the spring of the second year, from 60% to 100% reductions, with only one year of application. Figure 5 presents the results for thistle treated for one year with 8% vinegar.

We also examined impacts on other weed species. Results for dandelion (*Taraxacum officinale*) were complex. Sites that received 5% and 8% vinegar treatments during the first year suffered substantial mortality. Dandelion numbers were reduced by 90% by the end of the first year and close to 0% by the end of the second year; however, rebound was significant in the third year (with its minimal vinegar applications). Rebound was greatest (almost 100% of original numbers) in plots treated with 8% vinegar over two years. Plots that originally were treated with 5% vinegar and the 8% in the second year experienced only a 50% rebound in numbers. Figure 6 presents the results of an 8% vinegar treatment on dandelions for two years. Plots receiving only one year of treatment with 8% vinegar showed a similar 100% mortality after the first year, followed by 100% recovery in numbers in the second year. Figure 7 shows the results for dandelion treated with vinegar for one year.

Vinegar does appear to affect other invasive weeds. In 2008, we documented limited occurrences of *Heracleum autumnum* (orange hawkweed), *Leonanthum vulgare* (oxeye daisy), and *Galopis tetradif* (themp nettle). These plants had completely disappeared within a month after treatment with two applications of 8% vinegar and did not reoccur in 2008, 2007, or 2008. Although the numbers of these plants were small enough that other factors might have played a part in their failure to reoccur, results are suggestive.

### Livestock Trials

During the first year at the Danson site (2007), which had consistent grazing, the numbers of thistle plants in our test

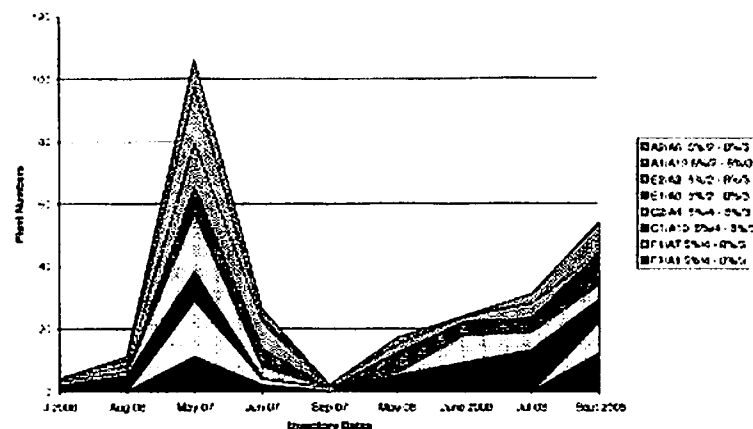


Figure 3. Vinegar control of *Cirsium arvense* 2006-2008; two years of treatment with 5% and 8% vinegar (each plot had two sets of numbers assigned to it for tracking purposes)

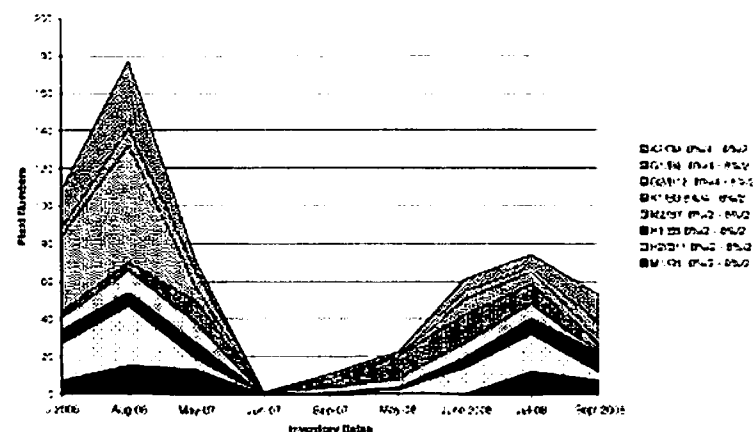


Figure 4. Vinegar control of *Taraxacum officinale* 2006-2008; two years of treatment with 5% vinegar (each plot had two sets of numbers assigned to it for tracking purposes)



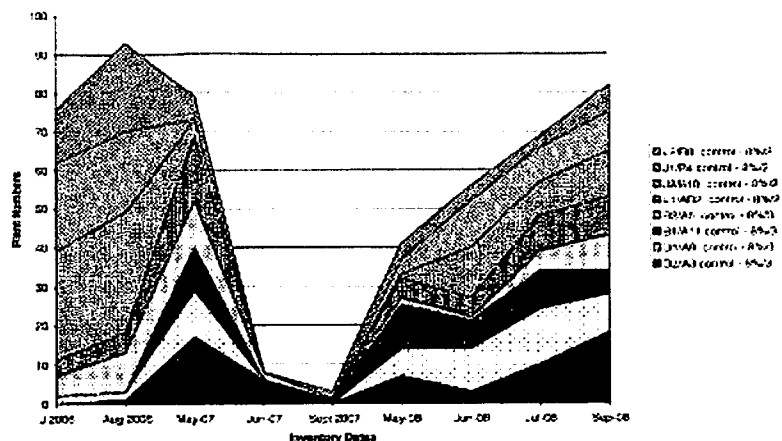


Figure 5. Vinegar control of *Cirsium arvense* 2006–2008, one year of treatment with 8% vinegar leach plot had two sets of numbers assigned to it for tracking purposes.

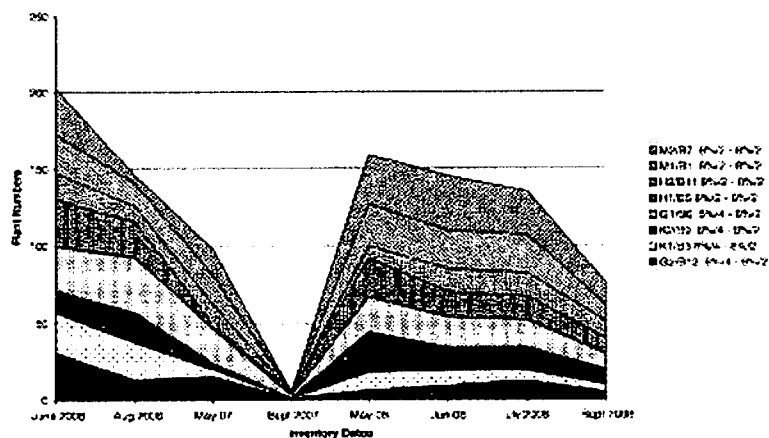


Figure 6. Vinegar control of *Taraxacum officinale* 2006–2008, two years of treatment with 8% vinegar leach plot had two sets of numbers assigned to it for tracking purposes.

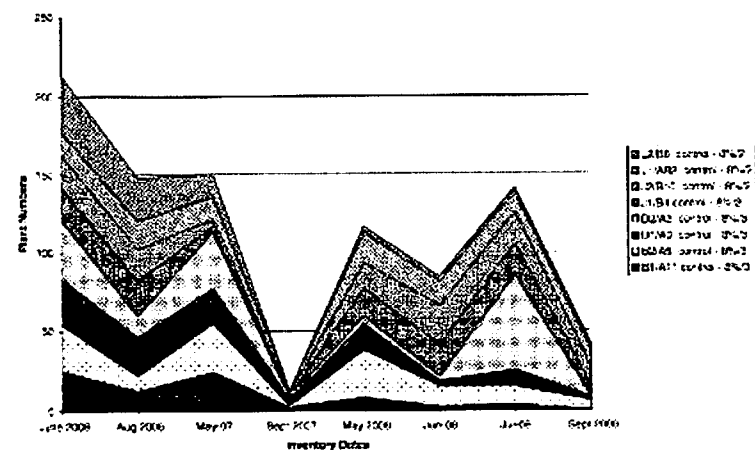


Figure 7. Vinegar control of *Taraxacum officinale* 2006–2008, one year of treatment with 8% vinegar leach plot had two sets of numbers assigned to it for tracking purposes.

plots experienced significant reductions, ranging from 35% to 100%, in the month after the introduction of the goats. By September, after mowing, the thistle had recovered 100% of their spring numbers. We speculate that mowing induced these plants to spread or to re-sprout more quickly than after grazing. The first inventory in 2008 demonstrated significant over-winter mortality. Plant numbers were reduced from 70% to 100% in our test plots. By mid-summer, all plots experienced a modest rebound to 50% of the previous year's numbers (one plot increased by 20% over the previous year), but by August, plant numbers again were declining by 20% to 30%. Plants numbers did not rebound to match pre-grazed levels of 2006, showing a significant overall reduction in total plant numbers. We are unclear, however, as to what impacted the thistle—grazing, mowing, or the combination of both.

The CN site presents mixed results. Thistle numbers rose significantly after a brief period of grazing by goats in mid-summer, only to decline precipitously in all but one plot over the winter (100% mortality). The singular exception (the most physically inaccessible plot, because it sits on the edge of a steep slope) showed a modest decline in

numbers after regular grazing in the second year. Figure 8 presents the findings regarding goat browsing on thistle for plots at both sites over two years.

Although we measured “success” in thistle control by the physical numbers of plants remaining within a test plot, we observed that there was significant evidence of browse of new thistle growth, reducing plant height by averages of 3 to 6 meters. The browse line against unreachable thistle was clearly visible and almost unbroken within the thistle patches. Further, the goats showed an obsessive interest in thistle flowers, which were removed promptly upon appearance. By our rough estimate, 90% of thistle flowers at both sites were consumed before seeding out (Figure 9).

Goats also affected two species of horsetail, *Equisetum arvense* and *Equisetum pratense*. At Hanson, *E. arvense* experienced 100% mortality by the August 2007 inventory and showed 0% recovery during 2008. *E. pratense* also demonstrated an 80% to 100% mortality by September 2007, but in the spring of 2008 demonstrated not only a recovery to original numbers but, in three plots, increases of 20% to 30%. The plants again showed 100% mortality by early

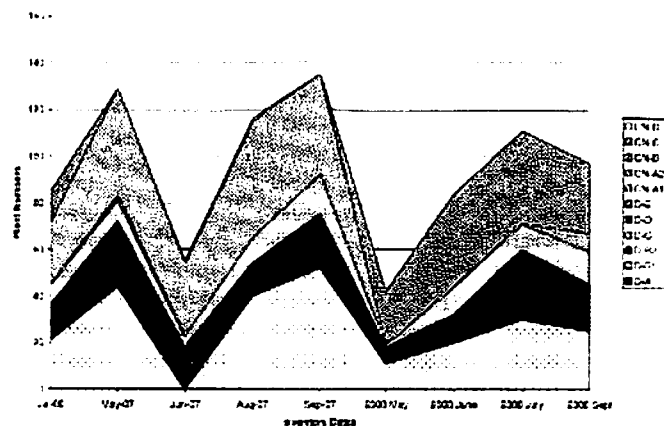


Figure 8. Goat control of Canada goose over time. DN = plots at the Danton site, CN = plots at the C.N. site.

September, however. The CN site held only *E. proutii*, which demonstrated a modest 50% drop after a few weeks of grazing in 2001, followed by a substantial increase the following spring. As at Danton, constant grazing dropped numbers steadily over the course of the next summer, reaching 100% mortality by September 2001. Figure 10 presents the results of goat browsing on *Epipactis* spp. at both sites over two years.

The goats did consume a native *Hieracium* species (hawkweed). At CN, numbers began dropping around the time of goat introduction—between 60% to 80%—followed by a rebound in the second spring. Constant grazing in the second year again reduced numbers to zero by June, but numbers increased again through to September. The Danton site presents another complex picture, with four plots demonstrating significant declines, while two show increases. Although the plants experienced a spring rebound in the second year, after a second summer of steady grazing, all but one plot had been reduced by almost 100%, while the exception demonstrated over a 50% decline in plant numbers. Although the species present was not *H. aurantiacum* (the species of interest for the Prince George region), samples of *H. aurantiacum* were picked at other sites and offered to the goats on two separate occa-

sions at both times; the goats very promptly consumed this species.

There is also evidence that goats eat *Leucanthemum vulgare* (mouse daisy). At CN, although numbers in the plots dropped after the introduction of the goats in the first year, they rebounded dramatically after their removal. By the second year, however, spring numbers were down 70% to 80% and the plant was almost completely eradicated by the time of the goats' removal. At Danton, the *Leucanthemum* experienced 40% mortality by the time numbers were 100% by September. Figure 11 presents the results for goats browsing on *Oxyria* species at both sites over two years.

Finally, goats do consume *Thymus officinalis*, the common dandelion, particularly early on in the season, but the goats were less interested as the leaves aged and became bitter. They specialized in eating flowers, which did prevent the plant from seeding the site. Results are more significant at the CN site, where four plots showed 50% mortality (one plot increased from zero to 45 plants). The Danton site demonstrated 100% mortality after the second year in three plots, while two plots doubled or tripled their numbers (one plot held no dandelions), suggesting that the dandelions are not always a preferred mouse.



Figure 9. An example of goat browsing on a dandelion in Prince George, British Columbia. (Photograph: Alex H. Campbell)

## Discussion

### Vinegar

It appears that a 10% vinegar solution controls Canada thistle, with most mortality showing up in the second year. We theorize that the three-year applications were more effective, because they gave the thistle a chance to try to regrow repeatedly, thereby depleting resources necessary for survival over-wintering. Two-week intervals did not permit regrowth and resources were simply stored until the next growing season. After two years of application, mortality remained significant, but there was rebound in the third year, with limited treatment, however, the numbers of thistle regrowing to the third year were substantially lower than post-treatment, by up to 85%. These findings suggest that vinegar cannot eradicate thistle, which can resprout or re-colonize by rhizome spread from adjacent sites, but it can reduce the individual plant's ability to survive. Intermittent treatment will likely always be re-

quired. Further research is needed to determine which intervals after an initial treatment would create lower thistle numbers.

Vinegar also offered some control against the ordinary dandelion over the short term, but less over the long term. Significant mortality occurred after a first year of vinegar application, but the plants proved more resistant during the second. This might be due to other environmental factors, differences in application techniques, or the possibility that a third year of treatment is required because the plant easily re-seeds. Dandelions are a plant of significant concern for municipalities. In Prince George, almost three-quarters of the public complaints logged over city grounds are regarding dandelions and almost half of the herbicides used are for the control of dandelions (Hadla, 2007). The ability of vinegar to partially control dandelions is therefore of interest to our municipal partner, although it appears more research will be required to determine if vinegar can fully control dandelions.

One caveat to the use of vinegar is that it is an effective control on more desirable vegetation. By the end of our second year, most vegetation in our trial plots also suffered significant mortality. *Phlox paniculata*, timothy grass and *Bromus tectorum* (barnyard) suffered significant mortality in the first year. The timothy grass did persist and began to grow again by the second year. It was substantially re-colonizing by the third year. In our third year, we re-seeded using red clover (*Trifolium pratense*), an acid-tolerant species. The clover re-colonized most plots successfully.

Vinegar offers economic savings over other herbicides. In 2002, Prince George paid \$6,000 to treat 400 hectares with conventional herbicides. Using 8% vinegar would cost approximately \$800 for the one trials and test labor costs were minimal, because we used existing research personnel. A municipality might have to budget for an additional summer staff person, depending upon the area requiring treatment, however, because vinegar requires minimal safety precautions and no special training or knowledge for application, this role might easily be filled with summer student labor rather than full-time municipal employees. Although vinegar use would require more frequent treatments than conventional herbicides, it offers compensatory benefits. Vinegar offers no known health risks. Some precautions are needed during application, but after it dries it has little impact on skin or lungs. Animals that utilize a treated site are unlikely to ingest any toxins as a consequence; this is not the case with conventional herbicides.

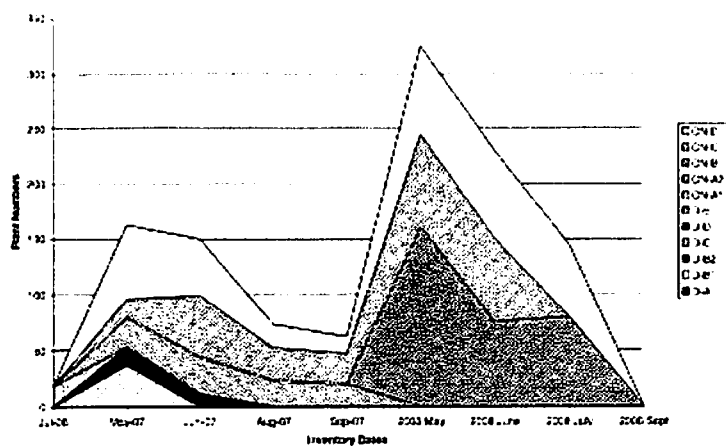


Figure 10. Goat control of *Equisetum* spp. 2005-2008; D = plots at the Danson site; CN = plots at the CN site

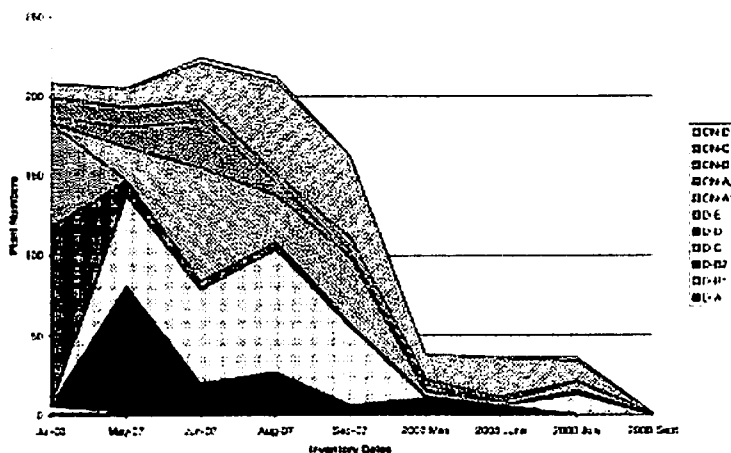


Figure 11. Goat control of *Lonicera caerulea* 2005-2008; D = plots at the Danson site; CN = plots at the CN site

Environmentally, we are still assessing impacts. We do not know vinegar's potential impact if large quantities were to enter a water body. Although any quantity of acid will cause disruptions, we do not know disbursement and flushing rates required to limit significant acidification.

#### Livestock Trials

The results for the use of goats are mixed, but suggestive. Delays in getting the goats on site during the first year of trial likely limited the effectiveness of grazing for controlling thistle. By the second year of grazing, thistle numbers were significantly reduced, but not completely eradicated. Visual inspection revealed that outside the fence line, thistle continued to look healthy and was spreading, suggesting that it was not a change in environmental factors that caused reduction in thistle numbers. We were able to document that goats prefer new growth on thistle and offered substantial control on seed proliferation through flower consumption. We believe it might take additional years of grazing to completely eradicate thistle and, given thistle's ability to move in from other sites, would likely require yearly grazing to maintain control. The results for oxeye daisies are very clear and goats appear to be a highly effective control, because this plant was eradicated from our test plots. Hawkweeds and horsetails also showed significant depletions by goats, which seem to be a reasonably effective control on these species.

Two years of grazing, however, is likely insufficient to provide very high levels of control of particularly pernicious plants such as thistles. Unlike vinegar or herbicides, goats do pick and choose what they consume and have clear rank order preferences in feeding, preferring younger growth for tough plants like Canada thistle. Other species, such as horsetails, are consumed regardless of their stage of growth.

Further, during both trial years, the mowing at the Danson site affected our findings. Mowing does stimulate an even-aged regrowth of new foliage in thistle. We are unclear, however, as to how this might have affected the impact of grazing overall. Further research, utilizing either pure grazing or more controlled mowing/grazing trials, is required.

The number of goats is also important. Four goats were inadequate for the Danson site, but were adequate at the CN site, which is approximately one-third the size of the Danson site, when given a full four months to graze. Six goats, however, provided substantial, although not complete, control at the Danson site during a full summer. We project that an area the size of Danson (21,673,60 square

meters, or 233,293 square feet) might require eight to ten goats for full control.

One further note on the use of goats: they proved to be a social success as well. The goats proved highly manageable by relatively unskilled individuals. The greatest difficulty was in ensuring that the gate and fencing were sufficient to prevent escape, which required early monitoring and nonetheless resulted in a few impromptu roundups (although the amount of graze available must be regularly monitored, hungry goats are highly motivated and competent at finding previously ignored areas). Care of the goats was minimal, involving daily checks to ensure fresh water was available, monitoring of health, and hoof trimming every few months. Transportation between sites was accomplished using only an SUV. Further, the goats proved popular with city staff needing to enter the sites, who perceived the goats to be friendly, non-threatening, and even interesting. Such acceptance on the part of municipal workers is essential for any new alternative to work. The City is currently planning to lease goats and place them back at the sewage ponds in 2009.

The goats were also popular with the public. Municipalities face public concerns over the use of alternative landscaping methods and weed control, which can limit the widespread adoption of alternatives. Given the social acceptance of the goats in Prince George, we believe that the City would not face extensive social resistance if they utilize goats on a regular basis.

Goats also proved to be very cost effective over the longer term, in comparison with conventional herbicide application. Costs for the goats involve one-time startup costs and ongoing maintenance costs. Startup costs were \$4,439. Ongoing costs were \$6,056, for a total of \$20,495 for one year of grazing approximately 2.891 hectares of land. In comparison to the City's cost for spraying a similarly sized area (\$9,129.42), goats do not seem cost effective; however, the largest proportion of costs was for fencing. Sites that are already fenced would not incur this cost. Mobile controls that can be taken from site to site or the use of a goat herder would result in fewer startup costs. Ongoing costs were considerably less expensive, reducing to \$1,656 in the second year (mostly for winter boarding). Given depreciation over time, the cost of using goats equals the cost of conventional herbicides within four years and, by year five, would result in cost savings. One cost-saving alternative for municipalities is to rent a herd from an owner, as did Seattle and San Francisco. Many ranchers are looking to financially justify their herds and this limits a municipality's

We could determine no risks to human health from goats. Goat feces do not appear to be a source of pathogens of concern. Although quantities were left behind, they decomposed over the winter, adding not nutrients. In terms of environmental costs, the goats did not graze the grass, focusing instead on weeds and tree saplings. Their use near flower beds, tree plantations, and ornamental plantings is not advisable, even though wide range in taste.

Another significant limitation on the use of goats is their vulnerability to domestic dogs. Solutions do exist, including the deployment of livestock guardian dogs or human guardians during the day, while securing the herd in a dog-proof enclosure at night. Within a municipal setting, wild predatory animals may or may not be a consideration. Interested municipalities would need to make a survey of known or potential threats to goats and plan accordingly.

The biggest obstacle we can identify to the use of goats is that appropriate containment might restrict the types of areas in which they can be utilized. Portable corrals at the use of goats could expand their utility; however, areas that are close to hazards, such as roadsides or residents; dogs, might never be suitable. Goats will likely work most effectively in larger areas such as waste lagoons, larger city parks and open spaces (with adequate guards), or institutions with large grounds (such as business parks or universities).

Although both are longer-term investments in weed control, vining and domestic goats each show considerable promise as alternative weed control mechanisms. They pose fewer risks to human health than do conventional herbicides, can be relatively cost effective (particularly over the long term) in comparison with conventional herbicides, and attract less social disapprobation than do conventional herbicides. Further, both appear to affect a broader range of noxious weeds than has been previously documented, suggesting the ability to utilize both for broad-ranging weed control. Although additional research—particularly if it takes a more sophisticated approach to statistical or economic analysis over a longer time frame—will be useful in fully determining long-term effectiveness, we believe this research supports such further investigation.

## Acknowledgments

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## Appendix M: Operations, Maintenance, and Stewardship 101

### Trail Maintenance and Management

Hosted by [AmericanTrails.org](http://AmericanTrails.org)

#### Operations, Maintenance, and Stewardship 101

*Operations, maintenance, and stewardship are essential to the safe use, enjoyment, and long-term success of any trail.*

*From the Fall 2005 issue of Trail Tracks, the magazine of American Trails*

By Robert Scarns  
American Trails Board

**"A community with trails and greenways needs to invest over the long term in a quality O & M program."**

an excellent project concept may die on the vine if these challenges are not adequately addressed. Here is an outline of the key elements of this vital aspect of trail management:

#### Operations and Maintenance Defined

**Operations and Maintenance** refers to the day-to-day upkeep as well as the smooth and safe functioning of a trail, greenway or trail/greenway system. The term

**Stewardship** refers to long-term care and oversight of the trail resource. This is essential to assure it will be sustained as a quality component of the community infrastructure and a good neighbor to adjacent properties and surrounding natural environment. Stewardship also includes building community support and advocacy so the integrity of the trail or greenway will not be compromised in the future.

**Routine Maintenance** refers to the day-to-day regimen of litter pick-up, trash and debris removal, weed and dust control, trail sweeping, sign replacement, tree and shrub trimming and other regularly scheduled activities. Routine maintenance also includes minor repairs and replacements such as fixing cracks and potholes or repairing a broken handrail.

**Remedial Maintenance** refers to correcting significant defects as well as repairing, replacing, or restoring major components that have been destroyed, damaged, or significantly deteriorated during the life of the project. Minor repairs such as repainting, seal coating asphalt pavement, or replacing signs may occur on a five to ten-year cycle. Major reconstruction items might occur over a longer period—up to 100 years or more—or after an event such as a flood. Other examples include stabilization of a severely eroded hillside, repaving a trail surface, or replacing a bridge. Remedial maintenance should be a consideration in formulating a long-term capital improvement plan, though budgeting could be on an individual and as-needed or anticipated basis.

It's not as glamorous as building the trail. There is no ribbon cutting for a maintenance program and seldom does upkeep win a national award. Yet, operations, maintenance, and stewardship are essential to the safe use, enjoyment, and long-term success of any trail. Increasingly, planners and elected officials want to see a workable O & M plan. They want to know the cost and how it will be funded.

Indeed,



Trails must do many things: promote safety, protect the environment, and provide quality experiences.

A quality O & M program addresses specific required tasks and begins with sound design, durable components, and a comprehensive management plan. The responsible officials and entities should embrace the plan at the beginning.

Programs and protocols that will endure should be instituted, including training of field and supervisory people. In addition, community groups, residents, business owners, developers and other stakeholders should be engaged in the long-term stewardship effort.

#### Guiding Principles for a Successful Program

The following guiding principles will help assure preservation of a first class system:

- Good maintenance begins with sound planning and design.
- Foremost, protect life, property, and the environment.
- Promote and maintain a quality outdoor recreation experience.
- Develop a management plan that is reviewed and updated annually with tasks, operational policies, standards, and routine and remedial maintenance goals.
- Maintain quality control and conduct regular inspection.
- Include field crews, police and fire/rescue personnel in both the design review and on-going management process.
- Maintain an effective, responsive public feedback system and promote public participation.
- Be a good neighbor to adjacent properties.

#### An effective O & M plan should include the following areas:

Maintenance: Routine and Remedial  
User Safety and Risk Management  
Programming and Events  
Resource Stewardship and Enhancement  
Marketing and Promotion  
Oversight and Coordination

#### Following are some of the typical O & M Activities for various types of trail amenities:

Inspection and Citizen Response  
Trail Surface Maintenance  
Repaving and Pavement Overlays  
Sweeping/Street Sweeping (For On-Street Facilities)  
Street Surface Upkeep and Repair (On-Street Facilities)  
Parking Lot Repair at Trailheads  
Maintain Connecting On-Street and Sidewalk Routes  
Vegetation and Pest Management (e.g. Trimming Overhanging Branches)  
Irrigation Systems  
Litter and Trash Removal  
Graffiti and Vandalism Control  
Dust Reduction  
Address Detours/Disruptions (With Workable Alternative Routes)  
Remedy "Social Trails" (Such as Shortcuts)  
Repair Trail Structures and Fixture/Erosion Control  
Signage (Especially Safety Signage), Striping and Lighting  
Rest Areas, Shelters and Water Stations (Including Equestrian)  
Toilet Facility Service  
Patrol, Security, Enforcement, Safety Hazard Reduction  
Special Event Policies and Permitting  
Education and Enforcement



Mile markers can assist with maintenance as well as provide information for trail users.



#### Accident and Incident Data Tracking

#### User Safety and Risk Management

User safety is critical to trail design, operations and management. Trail planners and managers should implement a safety program that includes: systematic risk management assessment, inter-agency design review for all proposed improvements and accident and crime reporting. In addition to department managers, planners, designers and engineers, law enforcement, fire/rescue and field maintenance personnel should be consulted in the design and review process.

#### Important steps in this process include:

Use sound design and engineering principals in the planning and design phase. For instance, trail designs should conform to currently established standards such as the Guide for the Development of Bicycle Facilities available from the American Association of State Highway and Transportation Officials (AASHTO). Safety and regulatory signage should conform to the Manual of Uniform Traffic Control Devices available at <http://mutcd.fhwa.dot.gov/> from the Federal Highway Administration. For good references that address accessibility standards, design of primitive trails, mountain bike facilities, bridges, boardwalks, and other facilities, visit the American Trails website: [www.americantrails.org](http://www.americantrails.org).

Consult experts in bicycle facility engineering for difficult situations such as at-grade street crossings, trails built next to roads, mid-block crossings and other challenges. It may be advisable to have an engineer review the entire plan set. Remember, bikes are vehicles and should be treated as such.

Include all points of view. Involve members of both genders, a variety of age groups, and law enforcement and fire/rescue people in reviewing plans. Concerns with respect to safety and security will vary depending on the perspective.

Implement an emergency response protocol with law enforcement, EMS agencies, and fire and rescue department that includes mapping of trail and open space access points, design of trails and access roads (to accommodate up to 6.5 tons), an "address/location positioning system" such as mile markers to identify locations and, where appropriate, 911 emergency phones in remote areas.

Implement a data base management system with law enforcement and fire/rescue to track specific location and circumstances of all accidents, reported incidents and crime and create a safety follow-up task force to address any problems that develop.

Routinely inspect for safety hazards, defective structures, missing safety signs, etc.

Promote user courtesy and trail etiquette and post and enforce safe user behavior and bicycle speed limits (in congested and risk areas).

Have a user feedback plan and problem hotline. Develop a procedure for timely and effective response.



Identifying roles and responsibilities of all workers is essential to good O & M planning.

Several steps can be effective on organizing leadership and effective administration of an O & M program including:

- Preparing and distributing an O & M manual with a specific listing of all functions, frequency of tasks, quality standards, and estimated unit costs and/or staffing requirements. This should be translated into an annual budget that anticipates build-out in five-year increments.

- The program should be goal-oriented and mission-focused based on the written and agreed to policies and guidelines.

- A lead individual or committee should be identified to serve as liaison/advocate for the system. This lead person should also work cooperatively with the respective department and agency heads and staff to assure a coordinated effort amongst all of the participants.

- Allocate discrete and adequate funding based on the written O & M program manual and annual budget.

- The program must be cost-effective with sustainable funding sources identified.

- Key participants in the O & M program should meet at least twice a year to assess performance for the past season and set direction, priorities, and funding needs for the upcoming season.

- Several agencies or jurisdictions may be involved in the management. Greenway systems often including neighboring communities or infrastructure partners such as a stormwater management agency or a highway department. An interagency maintenance agreement may be based on a memorandum of understanding (MOU) or other agreement that covers responsibilities, sharing of equipment, standards of performance, and cost sharing if applicable.

#### O & M costs and revenue

O & M costs can vary substantially depending on the facility, climate, and complexity of the system. For urban trail systems an annual per-mile cost might run from \$2500 to \$10,000.

#### Different sources of revenue may be identified including:

- General fund allocations;
- Revenue from right-of-way leases such as cable use;
- Participation and partnering with the stakeholders such as a flood control agency, streets department, or a homeowners association;
- Creation of an endowment from philanthropic or other sources to generate on-going revenue;
- Recruiting volunteers, youth and adopt-a-trail participants and sponsors.

While the annual O & M costs may seem intimidating, it is important to note that the return to the community in terms of recreational benefits, health and fitness, and economic development have been shown through a number of studies nationwide to be multi-fold.

A proper O & M program will reduce long-term costs by extending the life of trails and trail components, and it will win the support of the residents, homeowners, and businesses. A community with trails and greenways needs to invest over the long term in a quality O & M program. Indeed, a community, state or nation cannot afford to not make that investment.

*Robert Searns is a principal of Greenway Team, Inc., and works with communities nationwide on greenways, trails, and outdoor resource conservation.*

November 28, 2005

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Updated March 14, 2007

## Appendix N: Maintenance Management Systems for Trails

### Trail Maintenance and Management

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#### Maintenance Management Systems for Trails

*Trails work on federal lands is planned through a maintenance management system.*

By Lois Bachensky

U.S. Forest Service, Rocky Mountain Region

A maintenance management system provides the framework to plan, prioritize, schedule, and track maintenance work by:

- Setting specific maintenance goals and standards for levels of service.
- Developing the necessary maintenance programs which will provide those levels of service.
- Executing those programs using the most efficient combination of resources.
- Controlling and evaluating the effectiveness of the work in relation to the desired level of service.
- Furnishing cost data from which budgets can be built.

#### Scope

The first step in implementing a Maintenance Management System is to determine its scope. Identify trails to include in the system and the sources of information needed to implement the system.

#### Information Requirements

Trail plans, trail system maps and inventories, trail logs, traffic count information and condition surveys are valuable sources of information for developing maintenance management systems.

#### Trail Logs

Logs provide an inventory of the physical features on or adjacent to the trail, located in miles or increments from the beginning of the trail. The log should be updated when inventoried features are modified, replaced, removed or when other features are added. Trail logs are useful in the development of the maintenance budget and in determining the total dollar amount needed to fully maintain the trail system. By comparing the needed funds to available funds, you can determine the amount of work that must be deferred.

Logs are also useful when performing maintenance work by contract. If kept current, logs may be used to prepare documentation for contract packages, and show the location of structures and other features which require maintenance. Trail logs may be completed in conjunction with condition surveys. Information gathered for the logs may be directly entered on a trail log or the pertinent information may be entered into a tape recorder as the trail is hiked and later typed and filed on a trail log.

#### Maintenance Levels

Assign maintenance levels to trails based on criteria such as amount of use, potential to affect resources, safety considerations, etc. Once maintenance levels are established, they should be reviewed and updated annually.

When assigning maintenance levels, give higher priority to trails where use is significant. Use traffic counters to collect and record traffic volume data. This data collection should proceed on a continuing basis to provide needed information for planning, developing, monitoring, and confirming maintenance levels.

#### Maintenance Activities

Determine what maintenance activities will be tracked and the detail required. For example, activities may be tracked by a broad category such as by maintenance level. This would lump all the specific work activities and specific costs for these activities (such as cleaning waterbars, rebuilding dips, replacing tread, etc.) under the one broad activity, the maintenance level. In addition to cost tracking of this general maintenance level, specific activities may be tracked to aid in the preparation of contract estimates or to compare in-house costs to contract costs for certain activities.

#### Maintenance Standards

Maintenance standards should be established to document work requirements to meet the acceptable physical standard, or the acceptable end product for a maintenance level, or for a particular activity. The maintenance standard is met when all the work activities listed on the standard are completed.

#### Condition Surveys

Condition surveys should be performed on trails on which maintenance needs are anticipated. This may include trails in areas that historically have high maintenance needs due to steep grades, bad soils, drainage problems, etc. Also, special emphasis should be given to higher maintenance level trails on which problems are anticipated.

The trail condition survey documents the condition of an entire trail and it may include an explanation of the work required to bring the trail to standard. A condition survey format is shown for optional use.

#### Maintenance Prescription

As part of the condition survey or as a separate document, a "prescription" is written to show the work that is required to bring the trail to standard and the associated cost. The maintenance needs identified in the prescription should be prioritized and used in the development of the annual maintenance plan.

#### Developing Maintenance Plans

The following describes an optional method for preparation of a 5-year maintenance plan.

a. The person responsible for maintenance determines the following for each trail: (1) A maintenance level, (2) A base maintenance year, and (3) A maintenance frequency based on the expected trail use over the 5-year period. For example, a maintenance frequency of three would mean the trail is to be maintained once every three years.

After all information is collected, combine the individual plans to see if the annual maintenance plans for the 5-year period relate to the expected annual funding, and to assure that the movement of personnel and equipment from trail to trail is reasonable. Adjust the plan as necessary. When finalized, input the information from the forms into a computer system or a paper format. The resulting report will be the 5-year maintenance plan.

b. An annual maintenance plan may be developed from the 5-year plan by generating a computer or paper report which lists the trails to be maintained in any given year.

c. Prepare a trail maintenance work plan for the approaching season. Various formats for the maintenance plan may be developed. At a minimum, the plan must identify cost estimates, funding sources, and the party responsible for performing the work on the trails.

d. Use the annual maintenance plan to estimate costs for the required work and determine the funding needs for the next budget period.

#### Deferred Maintenance Plan

Develop a plan for the accomplishment of deferred maintenance. The plan should indicate the items of deferred maintenance, the estimated cost of the work, and the anticipated year of accomplishment. It should be balanced, to the extent possible, to accomplish a percentage of the deferred maintenance annually.

#### Scheduling

Document the work that will be performed within the field season. Documentation of work schedules is important (1) to ensure high priority work is accomplished first, (2) to determine if all required work is being accomplished on time and (3) to provide a documented history of maintenance scheduling for future maintenance managers.

Develop your own format to suit your particular needs. To authorize scheduled work, use formal or informal methods. Use of crew day cards may be used to assign required work to the maintenance crew or contractors and report accomplishments. The card contains information on the crew and equipment assigned, the period of work, location and project identification and a list of the work to be accomplished on a particular trail.

#### Monitoring and Evaluation

Following a field review of the completed work, a necessary part of the management is a system of work reporting and evaluation. The maintenance management system provides a way to document maintenance costs. It may be most efficient to report the accomplished work on the same document that the work was authorized. For example, if the crew day card was used, the same card may be used to report accomplishments and establish associated costs.

October 2000

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Updated March 16, 2007

## Appendix O: Trail Funding, from the State of Montana Trails Plan

### CHAPTER V. TRAIL FUNDING

Adequate funding is a critical trail-related challenge that affects many of the other issues addressed in this plan. This section overviews funding sources for trail projects at the federal, state, local, and private level, including requirements, restrictions, and limitations. A more detailed discussion of many of these funding sources is available in *A Guide to Grants for Community Planning and Development Projects in Montana: Resources for City and County Governments* (1995), by the Montana Department of Commerce. Additionally, the *FWP Trails Programmatic Environmental Impact Statement* (2000) provides a detailed analysis of two important state trails grant programs.

#### Federal Trail Managing Agencies

Since the federal trail managing agencies manage approximately 99 percent of the public trail miles in Montana, their ability to secure funding for trail projects is critical to the overall health of the system. As summarized below, federal agencies rely on their own trail-related funding, as well as outside sources and volunteer labor.

#### United States Forest Service

The forests utilize Forest Service funding, grants through various state-administered programs, donations, and volunteer in-kind services. Also, some forests are pursuing new sources of funding (e.g., user fee dollars generated through the new federal Fee Demonstration Program, which can include trailhead fees).

Current trends indicate that the Forest Service has reduced its funding for construction and maintenance of trails in Montana since 1995. Forest Service estimates show that maintenance funding decreased approximately 20 percent from

fiscal year (FY) 1995 to FY 1997, according to the Forest Service, construction funds have also decreased by approximately 40 percent during the same period. Decreasing federal funding is an important factor preventing forests from reaching their trail-related goals.

#### National Park Service

Funding comes primarily from the National Park Service operating budget and special funding sources. However, many parks are increasing their use of outside funding, including money available from cooperating partners. Significant funding has become available to national parks through the Fee Demonstration Program, authorized through 2002. The Program allows a portion of the gate revenue in participating sites to be utilized for projects within the park, including trail maintenance and construction.

#### Bureau of Land Management

Federally appropriated funds as well as grants and private contributions are utilized for funding. The BLM will also likely increase reliance on user fees for various facilities and activities. A high percentage of BLM trails are informal, non-system, unimproved routes.

#### Federal Funding Sources Available to Trail and Transportation Management Agencies

Federal programs constitute the largest source of funds for trails in Montana, both in terms of grant programs created specifically for recreational trails, and grant programs with related goals,



such as reducing pollution, preserving open space, and protecting natural resources.

#### Transportation Equity Act for the 21<sup>st</sup> Century (TEA-21)

Federal trails-related funding received a major boost with the passage of the Intermodal Surface Transportation and Efficiency Act (ISTEA) in 1991. Many hundreds of miles of trails were completed with funding made available through this historic piece of legislation, which represented a fundamental shift in the kinds of projects federal transportation dollars could be used for.

A number of the same trails-related programs were included in the new federal transportation legislation, which was passed in 1998. Similar to the old ISTEA legislation, the Transportation Equity Act for the Twenty-first Century (TEA-21) includes, among other components, the Surface Transportation Program (STP), National Recreational Trails Program (RTP), Congestion Mitigation and Air Quality Improvement Program (CMAQ), National Highway System and Federal Lands Highway Funds. All of these can be used to fund trails. More details are included below.

- **The Surface Transportation Program** includes a mandatory, ten percent set-aside for projects which fund federal, state, and local transportation improvements. The Montana Department of Transportation (MDT) administers the enhancement program called the Community Transportation Enhancement Program (CTEP), with selection of projects occurring at the local level. Among other things, CTEP funds trail-related projects including bicycle and pedestrian facilities, rail trails, and the acquisition of scenic, historic, and natural corridors and land. Local governments must match the federal money on a 1:1 basis.

- **The Recreational Trails Program** supplies federal trail dollars that are administered by FWP in Montana, and will be discussed in more detail later in the state funding section. When the original version of this was passed as a component of ISTEA, it was often

referred to as the "Symms Act" in reference to Senator Symms, one of its sponsors.

- **The Congestion Mitigation and Air Quality Improvement Program (CMAQ)** can be used for trail projects that promote alternative transportation projects with air quality benefits. Administered at the state level by the Montana Department of Transportation, this program is limited to "nonattainment" areas that failed to meet federal air quality standards for ozone, carbon monoxide, and particulate matter, as well as areas considered at high risk for becoming non-attainment areas. Projects eligible for funds include rail trail and bicycle trails.

- **National Highway System and Federal Lands Highway Funds** are primarily for construction and maintenance of highways. Alternative transportation, such as bicycle paths can be funded, but such projects are generally limited to improvements along the designated National Highway System or on federal lands. Projects must clearly demonstrate they provide a viable alternative to automobile commuting.

#### Land and Water Conservation Fund (LWCF)

The Land and Water Conservation Fund (LWCF) is a key federal funding program managed by the National Park Service, a component of which allows states to assist their political subdivisions by providing grants for the acquisition and development of public outdoor recreation projects, including trails. Another component of LWCF provides funding to federal agencies for resource conservation projects such as land purchases.

Since its inception in 1965, LWCF has provided over \$1 billion nationwide to states for outdoor recreation projects, with Montana receiving approximately \$11 million. Between 1995 and 1999, no funding was available in Montana for the LWCF local recreational grant program. At this writing (June, 2000), Congress is considering a bill—the Conservation and Reinvestment Act



of 2000 (CARRA) – which would permanently fund LWCF at a higher level than previously; more details on this proposal are included in the potential future funding sources section of this chapter.

### **Rivers and Trails Conservation Assistance Program**

Another component of the National Park Service, this program offers planning and organizational assistance for local community projects promoting nature-based recreation and environmental, historical, and cultural conservation projects. The Program has had a long involvement in trails projects.

### **Resource Conservation and Development Funds**

A program managed by the federal Natural Resources and Conservation Service, this fund is designed to encourage state and local governments and non-profit organizations to improve resource conservation by providing 50 percent matching funds for recreation, including parks and land acquisition.

### **Other Federal Programs**

A number of federal grants targeted at urban redevelopment, economic development, community non-profit groups, and other purposes can be used for trails. Some of these include Community Development Block Grants, the Entitlement Program, and the Small Cities Program. Entitlement Program Funds, in particular, are restricted to communities with a population of 50,000 or greater, and are earmarked for projects with economic, historic, and/or cultural merit. This program is administered by the Department of Housing and Urban Development and requires scenic matching of funds.

## **State Trails Grant Programs Managed by FWP**

The Parks Division of FWP administers three trail grant programs: the federally funded Recreational Trails Program (RTP), and the state funded Off-Highway Vehicle (OHV) and Snowmobile Grant Programs. Snowmobile trails in general and the Snowmobile Grant Program in particular was addressed in a programmatic environmental impact statement completed in 1993, and are not covered in this document.

Regardless of whether an FWP funded trails project is on federal, state, or private lands, it must comply with the Montana Environmental Policy Act (MEPA). On federal lands, trails must also comply with USFS Travel Plans, BLM Unit Plans, and the National Environmental Policy Act (NEPA).

### **Recreational Trails Program (RTP)**

The funding for RTP comes from the Federal Highway Administration (FHWA), but the program is typically managed at the state level by natural resource agencies, including FWP in Montana. The Program receives a share of the Federal Highway Trust Fund based on an estimate of motorized, non-highway recreational fuel consumption.

According to federal guidelines, at least 30 percent of the RTP funds must be allocated to motorized recreation, 30 percent to non-motorized recreation, and the remaining 40 percent is discretionary for diversified/mixed trails use. The Recreational Trails Program allows a maximum of 7 percent of a state's appropriation to be used for administration.

Reenacted in 1998 as a component of the new federal transportation legislation (TEA-21), this

program has provided a growing source of trails funding throughout the country. The amount available for Montana trail projects, for example, has increased from \$193,000 in 1997, to \$364,000 in 1998, \$486,000 in 1999, to an estimated \$643,300 annually in fiscal years 2000-2003.

The TEA 21 program requires an 80/20 cost share, unless a federal agency sponsors the project. In those cases, the federal agency can contribute 15 percent of the cost, requiring the applicant to come up with the remaining 5 percent of the match. The Recreational Trails Program is a reimbursable program, that is, sponsors are reimbursed with federal dollars after costs are incurred.

FWP can grant funds to federal, state, county, tribal, or municipal governments, as well as to private individuals and organizations. FWP has developed an application process with a priority ranking system to screen project applications (more details on the process are included in the Trails Program PEIS). Under federal regulations, the funds may be used for trail development, renovation, maintenance, acquisition, safety, and interpretation. States are encouraged to give priority consideration to environmental mitigation projects.

States qualifying for funding are required to have a State Trails Advisory Committee (STAC). Montana's committee is composed of eight members (plus alternates) representing hiking, snowmobiling, cross-country skiing, horseback riding, ATV riding, traditional and mountain bicycling, four-wheel (4WD) driving, and off-road motorcycling, as well as advisors representing the FWP, USFS, BLM, the Department of Transportation, and the Montana Wildlife Federation. The Advisory Committee makes recommendations on which projects to fund to FWP, which must approve the projects before they are submitted to the FHWA for final authorization.

Projects are evaluated and prioritized by the Advisory Committee based on the following criteria:

- Provides for a number of compatible recreational purposes, and unique or innovative corridor-sharing techniques.
- Provides linkages among existing trails systems, greenways, scenic byways, or other natural, cultural, historical, or recreational areas.
- Meets a clear and documented user demand.
- Provides trails near homes and workplaces.
- Has low maintenance requirements, or maintenance that will be provided by the applicant.
- Utilizes volunteer assistance or non-traditional labor.
- Provides for a wide range of abilities.
- Creates partnerships among trail users, private interests within the area, and public agencies.
- Furthers the goals of the State Trails Plan and/or other relevant plans.
- Has no other public funding available.
- Provides an opportunity that will be lost if not immediately funded.
- Provides new, unique, or more effective means for making trail opportunities available to the public.
- Addresses the access and use of trails by persons with disabilities, senior citizens, and other challenged populations or groups with disabilities.
- Incorporates cultural/natural resource interpretation and trail safety education in projects.



- Completes projects where NRITA funds were invested earlier.

Allowable uses of RTP funds include the following:

- Expenses incurred by the state to administer the program (no more than 7 percent of the state's allocation).
- Operation of state environmental protection and safety education programs relating to recreational use of trails (no more than 5 percent of state's allocation).
- Development of urban trail linkages near homes and work places.
- Construction and maintenance of trails on state, county, tribal, municipal, or private lands.
- Maintenance of trails on federal lands.
- Maintenance of existing recreational trails, including grooming and maintenance of trails across snow. States may allow purchases of snow grooming and mowing equipment.
- Restoration of areas damaged by trails and backcountry terrain use.
- Development of trailside and trailhead facilities (benches, restrooms, etc.).
- Provision of features that facilitate the access and use of trails by persons with disabilities.
- Acquisition of easements.
- Acquisition of property from a willing seller when the objective of a trail cannot be accomplished by other means.
- Where necessary and required by the State Comprehensive Outdoor Recreation Plan (SCORP)—and only when approved by the primary administering agency—the construction of new trails crossing federal lands.

Uses not permitted with RTP funds are as follows:

- Land acquisition by condemnation.
- Construction of new motorized trails on either USFS or BLM lands that have been designated as Wilderness Areas.
- Upgrading, expanding, or facilitating motorized use on trails that are predominantly non-motorized.

### *The Montana Off-Highway Vehicle (OHV) Program*

The FWP Parks Division also administers a grant program for the development, renovation, and maintenance of OHV trails and riding areas. The program supplies grants to maintain and renovate existing OHV trails and facilities, and to create safety and educational programs. The OHV Program is funded by OHV decal and registration fees, as well as a portion of the state gasoline dealers' license tax, based on the number of registered off-road vehicles.

Montana statute requires that all OHV's used on public lands for recreation must display an OHV decal. The OHV decal is \$5.00, with 40 percent of the proceeds used for enforcement, and 60 percent to develop and implement a comprehensive program and to plan for appropriate OHV recreation use. In addition to the decal fees, one-eighth of one percent of the distributor's gasoline tax is earmarked for the OHV program. The program devotes 10 percent of the money to promote OHV safety, up to 10 percent to repair areas that are damaged by OHV use, and the remaining funds to develop and maintain free public facilities. In the late 1990s, the total program budget was approximately \$160,000; more details on funding are included in the Trails Program PEIS.

The program is oriented toward projects that provide renovation or improvement to existing OHV trail or trail systems. Applications for OHV Program funding need to discuss the



following elements: 1) trails renovation; 2) soil stabilization measures to prevent or diminish erosion and provide a safe riding experience; 3) trail layout; 4) trail signing to provide users trail route information, natural resource or historic interpretation, and information about ethical conduct; 5) measures to reduce or eliminate resource impacts; 6) multiple-use benefits; and 7) noxious weed control.

OHV Program grants may be approved for the following project variables:

1. **Trail Maintenance & Renovation:** This may include brushing, grading, surfacing, bridges, retention walls, stiles, drainage structures (culverts, tiles, water bars, etc.), parking lots and grading, unloading platforms, larrines, trail-head kiosks, removing noxious weed control.
2. **Equipment:** No small tools will be approved for purchase with OHV funds. However, equipment commonly used for trail maintenance may be purchased with OHV funds. Leasing is preferred for larger pieces of equipment.
3. **Signs:** This includes trailhead signs, re-entrance blazes, cautionary and regulatory signs, general information signs, interpretive signs, etc.
4. **Labor and Administrative Costs:** Labor costs may only be reimbursed if that labor is accomplished by 1) governmental staff (only at existing salary rates), or 2) a private contractor. Administrative costs are not reimbursable. FWP prefers to invest limited OHV funds in on-site improvement and recommends that labor be accomplished through volunteers.
5. **Trail Mapping:** Mapping of trails using GPS or other technology can be funded as long as the appropriate trail managing agency has approved the work.
6. **Special Studies:** Special studies can be funded that provide information for OHV program planning and management.

Grants are for the full value of the project, as recommended by an OHV review and selection committee, and approved by FWP staff. However, FWP strongly recommends an investment by the project sponsor or cooperators such as cash, volunteer labor, and/or donated materials. Grants are provided to successful applicants (project sponsors) on an annual basis. A project sponsor may be an OHV club, OHV association, a chamber of commerce, or governmental agency working in conjunction with an OHV club.

### *The Montana Snowmobile Grant Program*

The Snowmobile Grant Program is managed by FWP, and helps provide and maintain facilities on Forest Service, BLM, state, county, and private land. Over 25 snowmobile clubs across Montana groom and maintain trail systems totaling in excess of 3,200 miles using state-awarded and funded equipment. As mentioned previously, snowmobiling and the Snowmobile Grant Program were covered in detail in a 1993 programmatic environmental impact statement, and will not be addressed in this plan.

### *Other State Trail Funding Sources*

#### *Montana Footpath and Bicycle Trail Act of 1975*

Administered by the Montana Department of Transportation (MDT), this act allows the Montana Transportation Commission to spend an average of \$200,000 annually for non-motorized foot and bicycle trails in areas with a demonstrated need for alternative transportation. No specific funding source was provided as part of the Act to support these activities.

## State General Funds

General funds from the state budget can be used for trail implementation. This source would require strong statewide public interest and political support.

## Tourism Infrastructure Investment Program (TIIP)

The Tourism Investment Program (TIIP), administered by Travel Montana at the State Department of Commerce, funds tourism-related infrastructure that could conceivably include urban trails related to visitor attractions.

## The University System

The University System can promote trails in a number of ways, including granting easements on university land, providing technical, planning, design, and construction assistance; and other collaborative efforts.

## Private/Non-Profit Funding Sources

Private sources of trails funds include non-profit organizations either directly or indirectly associated with trails, as well as corporate and business sponsors. A few of the larger national and state sources are discussed here, but a much larger number of potential private funding sources exist.

- **American Conservation Association:** Helps finance conservation programs, including greenway and open space projects by non-profit organizations.
- **A Territory Resource:** Provides grants for projects with high levels of citizen involvement that are environmentally sound, including open space, transportation, and riparian preservation planning. Non-profit organizations must be the lead group.

- **Nature Conservancy:** Provides financial assistance to preserve significant natural areas from development.
- **Rails-to-Trails Conservancy:** Offers technical assistance on a wide range of topics related to conversion of abandoned railways to trails and the sharing of active rail lines with trails.
- **Liz Clairborne-Art Ortenberg Foundation:** Dedicated to the conservation of nature, especially mitigating conflict over land and natural resources in rural communities, and the conservation of biological diversity. The foundation is particularly involved in promoting conservation in Montana. Non-profit organizations are eligible for funding programs including conservation planning, greenway projects, open space planning, and water/riparian preservation.
- **W.K. Kellogg Foundation:** The W.K. Kellogg Foundation has donated over \$25 million to its Rural Development Program. Non-profit organizations, and local governments to a lesser degree, are eligible for grants to preserve farmland and open space.
- **Harder Foundation:** The Harder Foundation has shown interest in helping preserve Montana's natural environment, including wetlands and grizzly bear habitat preservation.
- **Jessie Smith Noyes Foundation:** The Jessie Noyes Foundation funds projects that promote environmentally sound approaches to development, sustainable agriculture, and protect groundwater. Non-profit organizations are eligible, with local projects that preserve farmland and water/riparian areas.
- **Land Trusts:** A number of statewide and local land trusts that promote the preservation of open space and natural areas will also participate in creating and preserving trails and trail access. Montana is one of the leading states in the Nation in number of acres in conservation easements.



- **Continental Divide Trail Alliance:** This group monitors and supports the Continental Divide National Scenic Trail, which follows the Rocky Mountains from Canada to Mexico.
- **The Public Lands Access Association:** The Public Lands Access Association (PLAA) is a Montana non-profit organization involved in access to public land issues, especially in restoring historic accessways. The PLAA has been instrumental in re-opening a number of historic accessways throughout the state, sometimes resorting to legal means. The PLAA is also a resource for researching historical trails and access to public land.

## Local Trails Funding

Funding for local trail systems generally comes from city and county general funds, federal sources including CTEP funds, private donations and grants, state DNRC grants, and major business donations. Helena and Missoula have passed initiatives to acquire land for open space and trails. Local land trusts and other special interest groups, other trail managing agencies, as well as local service clubs and interested individuals, often donate money, time, and material. Many local trail agencies have enacted an "Adopt-a-Trail" program. In the thirty year period between 1965 and 1995, one of the most important mechanisms for funding local recreation projects such as trails were federal LWCF dollars, which funded hundreds of outdoor recreation improvements throughout Montana (see below).

## Potential Future Funding Sources

The single most important potential funding source for trail projects in Montana is the permanent funding of the federal Land and Water Conservation Fund (LWCF) through the Conser-

vation and Reinvestment Act (CARR). In November 1999, the House of Representatives' Resource Committee approved CARR by a 37-12 vote. As of April 2000, a vote in the full House had not yet occurred.

CARR has the potential to do for natural and recreation resources in the twenty-first century what the Federal Aid in Wildlife and Sport Fish Restoration acts of 1937 and 1950 began in the last. CARR, as H.R. 701 has become known, is landmark legislation that will provide on-going wildlife, land, and parks conservation with the largest infusion of federal funds in history. Over the next 15 years, most of the funds would go to various state and local conservation programs, including state-level wildlife conservation and local level parks and recreation developments.

Montana could see an infusion of more than \$5.8 million annually to help conserve many of the state's dwindling wildlife species and habitats. An additional \$4 million or more would come to Montana every year to help fund state and local LWCF projects such as developing new trails, restoring historic parks, constructing local recreational facilities, and purchasing open space. The legislation also includes financial incentives to private landowners for maintaining threatened species and for conservation easements.

CARR's concepts have been supported by more than 3000 groups and organizations, including the National Governors Association, the Western Governors Association—including Montana Governor Marc Racicot—the National Association of Counties, and the Montana League of Cities and Towns.

In addition to CARR—and as discussed elsewhere in this chapter—the Federal Fee Demonstration Program has the potential to play an increasingly important role in trail funding. Whether the Program becomes a permanent, long-term funding component remains to be seen; many public land users are opposed to paying additional fees to utilize public lands, yet the Program appears to have substantial political momentum and support.